O C T A G O N S Y S T E M S

Embedded PCs For Extreme Environments

PC–680 User's Manual

5474 (0406)

DiskOnChip® is a registered trademark of M–Systems. LynxOS® is a registered trademark of Lynx Real–Time Systems, Inc. Micro PC™, PC SmartLink™, Octagon Systems Corporation®, the Octagon logo and the Micro PC logo are trademarks of Octagon Systems Corporation. PICO FA™ is a trademark of Phoenix Technologies Ltd. QuickBASIC® is a registered trademark of Microsoft Corporation. QNX® is a registered trademark of QNX Software Systems Ltd. ROM–DOS™ is a trademark of Datalight. Windows 98™, Windows NT™, and Windows CE™ are trademarks of Microsoft Corporation.

Copyright 2000, 2003, 2005, 2006—Octagon Systems Corporation. All rights reserved. However, any part of this document may be reproduced, provided that Octagon Systems Corporation is cited as the source. The contents of this manual and the specifications herein may change without notice.

The information contained in this manual is believed to be correct. However, Octagon assumes no responsibility for any of the circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement. Octagon makes no representation or warranty that such applications will be suitable for the use specified without further testing or modification.

Octagon Systems Corporation general policy does not recommend the use of its products in life support applications where the failure or malfunction of a component may directly threaten life or injury. It is a Condition of Sale that the user of Octagon products in life support applications assumes all the risk of such use and indemnifies Octagon against all damage.

OCTAGON SYSTEMS

6510 W. 91st Ave.
Westminster, CO 80030

Technical support: 303–426–4521

Telephone: 303–430–1500
FAX: 303–426–8126
Web site: www.octagonsystems.com

IMPORTANT!

Please read the following section before installing your product:

Octagon's products are designed to be high in performance while consuming very little power. In order to maintain this advantage, CMOS circuitry is used.

CMOS chips have specific needs and some special requirements that the user must be aware of. Read the following to help avoid damage to your card from the use of CMOS chips.

≡ Using CMOS circuitry in industrial control

Industrial computers originally used LSTTL circuits. Because many PC components are used in laptop computers, IC manufacturers are exclusively using CMOS technology. Both TTL and CMOS have failure mechanisms, but they are different. Described below are some of the failures which are common to all manufacturers of CMOS equipment. However, much of the information has been put in the context of the Micro PC.

Octagon has developed a reliable database of customer-induced, field failures. The average MTBF of Micro PC cards exceeds 11 years, yet there are failures. Most failures have been identified as customer-induced, but there is a small percentage that cannot be identified. As expected, virtually all the failures occur when bringing up the first system. On subsequent systems, the failure rate drops dramatically.

- Approximately 20% of the returned cards are problem-free. These cards, typically, have the wrong jumper settings or the customer has problems with the software. This causes frustration for the customer and incurs a testing charge from Octagon.
- Of the remaining 80% of the cards, 90% of these cards fail due to customer misuse and accident. Customers often cannot pinpoint the cause of the misuse.
- Therefore, 72% of the returned cards are damaged through some type of misuse. Of the remaining 8%, Octagon is unable to determine the cause of the failure and repairs these cards at no charge if they are under warranty.

The most common failures on CPU cards are over voltage of the power supply, static discharge, and damage to the serial and parallel ports. On expansion cards, the most common failures are static discharge, over voltage of inputs, over current of outputs, and misuse of the CMOS circuitry with regards to power supply sequencing. In the case of the video cards, the most common failure is to miswire the card to the flat panel display. Miswiring can damage both the card and an expensive display.

- **Multiple component failures** - The chance of a random component failure is very rare since the average MTBF of an Octagon card is greater than 11 years. In a 7 year study, Octagon has never found a single case where multiple IC failures were not caused by misuse or accident. It is very probable that multiple component failures indicate that they were user-induced.

- **Testing "dead" cards** - For a card that is "completely nonfunctional", there is a simple test to determine accidental over voltage, reverse voltage or other "forced" current situations. Unplug the card from the bus and remove all cables. Using an ordinary digital ohmmeter on the 2,000 ohm scale, measure the resistance between power and ground. Record this number. Reverse the ohmmeter leads and measure the resistance again. If the ratio of the resistances is 2:1 or greater, fault conditions most likely have occurred. A common cause is miswiring the power supply.

- **Improper power causes catastrophic failure** - If a card has had reverse polarity or high voltage applied, replacing a failed component is not an adequate fix. Other components probably have been partially damaged or a failure mechanism has been induced. Therefore, a failure will probably occur in the future. For such cards, Octagon highly recommends that these cards be replaced.

- **Other over-voltage symptoms** - In over-voltage situations, the programmable logic devices, EPROMs and CPU chips, usually fail in this order. The failed device may be hot to the touch. It is usually the case that only one IC will be overheated at a time.

- **Power sequencing** - The major failure of I/O chips is caused by the external application of input voltage while the Micro PC power is off. If you apply 5V to the input of a TTL chip with the power off, nothing will happen. Applying a 5V input to a CMOS card will cause the current to flow through the input and out the 5V power pin. This current attempts to power up the card. Most inputs are rated at 25 mA maximum. When this is exceeded, the chip may be damaged.

- **Failure on powerup** - Even when there is not enough current to destroy an input described above, the chip may be destroyed when the power to the card is applied. This is due to the fact that the input current biases the IC so that it acts as a forward biased

diode on powerup. This type of failure is typical on serial interface chips.

- **Under rated power supply:** The board may fail to boot due to an under rated power supply. It is important that a quality power supply be used with the PC–680 that has sufficient current capacity, line and load regulation, hold up time, current limiting, and minimum ripple. The power supply for the PC–680 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This ensures that all the circuitry on the PC-680 sequences properly and avoids system lockup.
- **Excessive signal lead lengths** - Another source of failure that was identified years ago at Octagon was excessive lead lengths on digital inputs. Long leads act as an antenna to pick up noise. They can also act as unterminated transmission lines. When 5V is switch onto a line, it creates a transient waveform. Octagon has seen submicrosecond pulses of 8V or more. The solution is to place a capacitor, for example 0.1 μF, across the switch contact. This will also eliminate radio frequency and other high frequency pickup.

≡ Avoiding physical damage to the heatsink/CPU

WARNING!
When handling any Octagon CPU card, extreme care must be taken not to strike the heatsink (if installed) against another object, such as a table edge. Also, be careful not to drop the CPU card, since this may cause damage to the heatsink or CPU as well.

Note Any physical damage to the CPU control card is **not** covered under warranty.

Abbreviations and terms used in this manual

Throughout this manual, the following symbols and terms are used:

Autoexecution	Automatic execution of a program on powerup or reset.
BIOS	Basic Input Output System. Detailed instructions that activate peripheral devices. See ROM–DOS.
BIOS drive	The solid–state disk which contains the system BIOS and ROM–DOS.
bpp	bits per pixel
Console port	Video card or COM1 where BIOS and DOS messages appear and keyboard input is available.
DRAM	Dynamic Random Access Memory devices. DRAMs provide volatile memory with unlimited read and write cycles.
Expansion card	The expansion cards add I/O functions to the Micro PC system, such as analog input/output, digital input/output, motion control, and display.
Flash	Electrically erasable PROM which allows at least 100,000 write cycles.
h	The suffix "h" denotes a hexadecimal number. A decimal number has no prefix or suffix. For example, 1000h and 4096 are equivalent.
KB	Kilobyte (1,024 8–bit bytes).
MB	Megabyte (1,048,576 8–bit bytes).
Memory device	The type of static RAM, DRAM, flash memory, or EPROM specified for either volatile or nonvolatile memory.
PC/104 expansion	An expansion bus used for holding 8– and 16–bit expansion cards.
PC Video	A feature on the PC–680 which imports an external video source into the virtual graphics array (VGA) system. This feature allows for advanced video connections including video overlays.
FlashFX	Datalight's flash file system used to access SSDs from DOS as a read/write DOS drive.
ROM	Read Only Memory devices. ROMs provide non-

	volatile memory, have a limited number of write cycles, and include EPROMs and EEPROMs.
ROM–DOS	Operating system included in Micro PC ROM.
Single board computer	A printed circuit board that contains a complete computer: CPU, memory, I/O, and clock. The single board computer controls the operation of all the expansion cards.
Solid–state disk (SSD)	A simulated disk which uses a high speed solid–state memory device. For example, flash memory, EEPROM, or static RAM.
SRAM	Static Random Access Memory device. SRAMs provide volatile memory with unlimited read and write cycles. They may be used with a backup battery.
Terminal emulator	A serial communications software package designed to simulate a terminal required to gain access to another computer.
TTL compatible	Transistor transistor logic compatible; 0–5V logic levels.
Virtual drive	A disk created in DOS or extended memory which emulates an actual disk. The virtual drive provides temporary storage for files. When power to the computer is turned off the virtual drive disappears.
W[–]	Denotes a jumper block and the pins to connect.
XMODEM	A communications protocol which allows transfer of files between two computers.
XON/XOFF	A communications protocol for asynchronous connections. The receiver can pace the sender by sending the XOFF and XON characters to stop and continue the data flow.
+5V Safe	+5V at the I/O connectors that is protected by a 0.75A fuse.

Conventions used in this manual

This section explains the format used for notes, warnings, and command entry.

≡ Notes and warnings

Special notes and warnings appear in this manual. Each one has a different meaning and format. They are as follows:

Note A note is supplementary or background information. At other times, it is a hint or reminder that makes a task easier or quicker.

WARNING!

A warning gives vital information. Failure to heed a warning may cause system failure, equipment damage, or bodily harm to the system operator.

≡ Command format and procedures

For some commands, you will only enter a single keyword (for example, **reset**). For most commands, however, you will enter several keywords followed by one or more parameters for which you must supply values.

Commands must be entered in a specific format. To indicate the format, this manual uses a series of conventions that are explained below. The conventions cover the rules for issuing all commands, including the most complex ones. Most commands, however, are much simpler.

The command format looks like this:

command [**type_this | or_ this**] *input* {*optional_input*}

Follow these rules and conventions:

- Information which appears on your screen is shown in a different type face, for example:

```
PhoenixBIOS 4.0 Release 6.0
Copyright 1985-1998 Phoenix Technologies Ltd.
All Rights Reserved
```

```
Octagon Release: VX.14B-2/3/00
```

- Commands that you must key in are shown in **`Courier Bold`**, for example:

  `C:>` **`RESET`**

- Italicized refers to information that is specific to your particular system or program, e.g.,

  Enter *`filename`* means enter the name of your file.

- Paired angle brackets are used to indicate a specific key on your keyboard, e.g., <ESC> means the escape key; <CTRL> means the control key; <F1> means the F1 function key.

- All addresses are given in hexadecimal, for example, 328h.

About this manual

The *PC–680 user's manual* provides information about installing and configuring the PC–680. This manual is divided into four sections:

- Section 1 — Installation

  Chapter 1: Overview
  Chapter 2: Quick start
  Chapter 3: SETUP programs
  Chapter 4: Save and run programs

- Section 2 — Hardware

  Chapter 5: Serial ports
  Chapter 6: LPT1 parallel port
  Chapter 7: Console devices
  Chapter 8: SSDs, DRAM, and battery backup
  Chapter 9: External drives
  Chapter 10: Digital I/O
  Chapter 11: CRTs and flat panels
  Chapter 12: PC/104 expansion
  Chapter 13: Ethernet
  Chapter 14: USB

- Section 3 — System management

  Chapter 15: Watchdog timer and hardware reset
  Chapter 16: Serial EEPROM and CMOS RAM
  Chapter 17: User-defined jumper
  Chapter 18: CPU power management
  Chapter 19: Troubleshooting

- Section 4 — Appendices

  Appendix A: Technical data
  Appendix B: Software utilities
  Appendix C: Third party support
  Appendix D: Accessories
  Appendix E: Operation in severe environments

Contents

Using CMOS circuitry in industrial control 1
Avoiding physical damage to the heatsink/CPU 3

Contents iii

List of figures ix

List of tables x
Abbreviations and terms used in this manual xii
Conventions used in this manual xiv
Notes and warnings xiv
Command format and procedures xiv

About this manual xix

Overview: Section 1 – Installation xxi

Chapter 1: Overview 1-1
Description 1-1
PC–680 major hardware features 1-1
CPU 1-1
Up to 128 MB SDRAM 1-1
Solid–state disks 1-1
SSD0 1-2
SSD1 1-2
Floppy and hard disk ports 1-2
Boot sequence 1-2
Serial ports protected against ESD 1-2
Multifunctional printer port 1-3
Keypad and LCD display support for low cost operator interface 1-3
32–bit digital I/O with versatile configuration 1-3
USB 1-3
PCI bus XVGA, flat panel interface, and GUI accelerator 1-4
Adjustable display bias supply 1-4
Speaker, keyboard, and mouse ports 1-4
PC/104 16–bit interface 1-4
Ethernet 1-4
Watchdog timer added for safety 1-5
Hardware reset 1-5
Real time calendar/clock with battery–backup 1-5
5 Volt operation lowers system cost 1-5
Rugged environmental operation 1-5
Size 1-5
PC–680 major software features 1-6
Advanced power management and system management input 1-6
Diagnostic software verifies system integrity automatically 1-6
BIOS SETUP information stored in EEPROM for high reliability 1-6
Phoenix BIOS 1-6
"Instant DOS" operating system 1-6
Programmable video BIOS 1-6
On–board flash file system 1-7
Octagon BIOS extensions 1-7

Chapter 2: Quick start 2-1
Configuration Jumpers 2-1
Installing the PC–680 2-4
Installation 2-4
Speaker 2-4
Keyboard and mouse 2-4
PC–680 power supply requirements 2-8
Running a demo program 2-9
Logon message 2-9
What's next 2-11

Chapter 3: BIOS setup 3-1
Introduction 3-1
BIOS setup 3-1
Running BIOS setup 3-1

Chapter 4: Save and run programs 4-1
Save and run your programs on the PC–680 4-1
Saving programs and support files 4-1
Adding your application 4-2
Autoexecuting your application from SSD1 4-2
Autoexecuting your application from SSD0 4-2
Overriding the autoexecution of your application 4-3
Option 1 4-3
Option 2 4-3
Option 3 4-3

Overview: Section 2 – Hardware

Chapter 5: Serial ports 5-1
Description 5-1
Serial port configurations 5-2
COM1 / COM 2 5-3
COM3 / COM 4 5-3
COM5 5-6
COM6 5-6
Global Positioning System Interface 5-7
COM3 through COM6 interrupt/status register 5-8
Function and use of serial ports 5-9
COM1 as serial console device 5-9
COM1 through COM6 as RS–232 I/O 5-9
COM3 / COM4 - RS–422, and RS-485 5-10
RS-422 5-10
RS-485 5-10
Transmitter Control 5-11

Chapter 6: LPT1 parallel port 6-1
LPT1 parallel port 6-1
Printer 6-1
Installing a printer 6-1
Display 6-2
Installing a display 6-2
Keypad 6-3
Installing a keypad 6-3

Chapter 7: Console devices 7-1
Description 7-1
Selecting console devices 7-1
XVGA 7-1
Serial console 7-1
Transferring files between the PC–680 and your PC 7-3
Transferring files to the PC–680 7-4
Transferring files from the PC–680 7-5
Example of downloading a file to the PC–680 7-6
Remote disks 7-8
Downloading files to the PC–680 using REMDISK/REMSERV 7-8

Chapter 8: SSDs, DRAM, and battery backup 8-1
Description 8-1
SSD0 8-1
Battery backup for SSD0 SRAM and real time calendar clock 8-2
SSD1 8-2
Managing SSDs 8-3
Flash file system 8-3
Defining SSDs using SETSSD 8-3
SETSSD 8-3
Using FXFMT to format an SSD 8-5
Formatting SSD1 8-5
Using SYS to make an SSD bootable 8-5
Adding operating system startup files (using SYS) 8-5
Using SETSSD and TESTOEM to test an SSD 8-6
Making copies of the PC–680 SSD 8-7
Programming copies of the PC–680 SSD 8-7
Programming a new BIOS into SSD1 8-8
DRAM 8-8

Chapter 9: External drives 9-1
Description 9-1
Floppy disk controller 9-1
Power requirements 9-1
Installing a floppy disk drive 9-1
Hard disk controller 9-1
Power requirements 9-2
Installing an IDE drive: 9-2

Chapter 10: Digital I/O 10-1
Description 10-1
Major features 10-1
Software 10-1
Jumpers and connectors 10-2
Programmable registers 10-3
Standard operating mode 10-3
I/O port operation 10-3
Event sense operation 10-4
Mask register operation 10-4
Enhanced operating mode 10-5
Register bank selection 10-5

Bank 0 operations 10-5
Digital I/O (I/O0–I/O31), registers 0–3, bank 0 (r/w) 10-5
Mask register: Register 7, bank 0 (r/w) 10-6
External event sense register: Register 6, bank 0 (r/w) 10-7
Bank 1 operations 10-7
Event sense registers: Registers 0–3, bank 1 (r/w) 10-7
Event control register 0: Register 6, bank 1 (w) 10-8
Event status register 0: Register 6, bank 1 (r) 10-8
Event control register 1: Register 7, bank 1 (w) 10-9
Bank 2 operations 10-10
Debounce control register: Register 0, bank 2 (r/w) 10-10
Debounce duration register 0: Register 1, bank 2 10-11
Debounce duration register 1: Register 2, bank 2 10-12
Bank select register 2: Register 7, bank 2 (r/w) 10-13
Octagon operating mode 10-13
Advanced control register 0 (Address offset: 10h) 10-13
Delta sense register (0–5): (Address offset: 12h–17h) 10-14
Polarity event extended registers (0–5):
(Address offset 10h–1Dh) 10-14

Chapter 11: CRTs and flat panels 11-1
Description 11-1
Video features 11-1
Programming the video BIOS 11-2
Connecting a monitor 11-3
Analog monitor 11-4
Connecting a flat panel display 11-4
Flat panels requiring bias voltage 11-5
LCD bias control example 11-5
Connecting the flat panel to the PC–680 11-6

Chapter 12: PC/104 expansion 12-1
Description 12-1

Chapter 13: Ethernet 13-1
Description 13-1
Ethernet drivers 13-1

Chapter 14: USB 14-1
Description 14-1

Chapter 15: Watchdog timer and hardware reset 15-1
Description 15-1
Enhanced INT 17h function definitions 15-1
Enable watchdog 15-1
Strobe watchdog 15-3
Disable watchdog 15-3
Hardware reset 15-4

Overview: Section 3 – System management

Chapter 16: Serial EEPROM and CMOS RAM 16-1
Description 16-1
Enhanced INT 17h function definitions 16-1

Serial EEPROM 16-1
Read a single word from the serial EEPROM 16-1
Write a single word to the serial EEPROM 16-2
Read multiple words from the serial EEPROM 16-3
Write multiple words to the serial EEPROM 16-3
Return serial EEPROM size 16-4

Chapter 17: User-defined jumper 17-1
User-defined jumper 17-1
Read jumpers 17-1

Chapter 18: CPU power management 18-1
Description 18-1
Power management overview 18-1
Power Savings 18-1
Customized 18-1
Maximum Power Savings 18-2
Maximum Performance 18-2
Thermal management 18-2
Thermal Setpoint 18-2
Thermal Hysterises 18-2
Fan Control 18-3

Chapter 19: Troubleshooting 19-1
No screen activity – checking console serial communications 19-1
Garbled serial console screen activity 19-1
System generates a BIOS message but locks up when booting from SSD1 19-2
Flash file reports a drive, but issuing a DIR generates an error message 19-2
Flash file does not report the drive 19-2
System will not recognize hard drive 19-2
System locks up after powerdown/powerup 19-3
Technical assistance 19-3
POST Codes 19-4

Overview: Section 4 – Appendices

Appendix A: Technical data A-1
Technical specifications A-1
CPU A-1
PCI bus speed A-1
ISA bus speed A-1
SDRAM A-1
SSD0 ..... A-1
SSD1 ..... A-1
SSD2 ..... A-1
Floppy drive A-1
EIDE drives A-1
Video A-2
10/100Base–T Ethernet port A-2
Serial I/O A-2
Parallel port A-2

Digital I/O A-2
USB A-3
Speaker A-3
Keyboard, mouse port A-3
PC/104 interface A-3
Battery backup A-3
Watchdog timer A-3
Bus mastering A-3
BIOS A-3
ROM–DOS A-3
Power requirements A-3
Voltage supervisor A-4
Environmental specifications A-4
Size A-4
Connectors A-10
Connector pinouts A-11

Appendix B: Software utilities B-1
Introduction B-1
Support commands and device drivers: B-1
GETBIOS.EXE B-2
GETIMG.EXE B-2
GETIMGH.EXE B-3
I17HNDLR.EXE B-4
LCDBIAS.EXE B-5
LPT1CON.COM B-6
FXFMT.EXE B-7
FXDOS.SYS B-7
PGMBIOS.EXE B-8
PGMIMG.EXE B-9
PGMIMGH.EXE B-10
REMDISK.EXE B-11
REMQUIT.COM B-13
REMSERV.EXE B-14
RESET.COM B-15
SETSSD.EXE B-16
TESTOEM.EXE B-17
TRANSFER.EXE B-18

Appendix C: Third party support C-1
Using M–Systems DiskOnChip (DOC) C-1

Appendix D: Accessories D-1

Appendix E: Operation in severe environments D-1
Operation under high / continuous vibration D-1
Operation at high temperatures D-1

Warranty
Limitations on warranty 1
Service policy 1
Returning a product for repair 2
Returns 2
Governing law 2

List of figures

Figure 2-1 PC-680 component diagram 2-5
Figure 2-2 PC-680 center-to-center mounting hole diagram 2-6
Figure 2–3 Power connector 2-7
Figure 2–4 Keyboard and monitor connections 2-8
Figure 5–1 Null modem adapter and VTC–20F cable 5-9
Figure 5–2 PC-680 serial devices 5-10
Figure 5–3 RS-422 and RS-485 hookup diagrams 5-12
Figure 6–1 LPT1 as a printer port 6-2
Figure 6–2 LPT1 as a display and/or keypad port 6-3
Figure 7–1 The PC–680 and a serial console 7-2
Figure 7–2 VTC–20F cable and null modem adapter 7-3
Figure 7–3 Downloading files to the PC–680 using REMDISK/REMSERV 7-8
Figure 11–1 The PC–680, a VGA monitor, and a PS–2 compatible keyboard 11-2
Figure 11–2 The PC–680 and a VGA monitor 11-4
Figure 11–3 The PC–680 and a flat panel display 11-6
Figure 12–1 Typical PC/104 module stack 12-1
Figure B–1 Cabling diagram for a standard cable B-12

List of tables

Table 2–1 PC–680 jumper configurations 2-2
Table 2–2 PC–680 jumper configurations (continued) 2-3
Table 3–1 PC–680 BIOS setup parameters 3-2
Table 3–2 PC–680 BIOS setup parameters (continued) 3-3
Table 3–3 PC–680 BIOS setup parameters (continued) 3-4
Table 3–4 PC–680 BIOS setup parameters (continued) 3-5
Table 3–5 PC–680 BIOS setup parameters (continued) 3-6
Table 3–6 PC–680 BIOS setup parameters (continued) 3-6
Table 5–1 COM port configurations 5-2
Table 5–2 COM1 and COM2 pinout (J7 connector) 5-3
Table 5–3 COM3 and COM4 pinout (J10 connector) 5-4
Table 5–4 COM3 and COM4 jumper configurations 5-5
Table 5–5 COM5 and COM6 pinouts for RS-232 (connector J14) 5-7
Table 5–6 COM5 and COM6 pinouts for GPS (connector J19) 5-7
Table 5–7 Interrupt status register 5-8
Table 5–8 COM3, COM4 transmitter control 5-11
Table 6–1 LPT port 6-1
Table 8–1 SSD0 device selection jumpers: W20, W21 8-1
Table 8–2 Battery connector: J13 8-2
Table 10–1 Digital I/O port 10-1
Table 10–2 W5: Pull–up and pull–down jumpers 10-2
Table 10–3 J6: Digital I/O [0:7], [8:15], [16:23], J5: Digital I/O [24:31] 10-2
Table 10–4 Standard I/O port addressing 10-3
Table 10–5 I/O point write/read ports (port and I/O point assignments) 10-3
Table 10–6 Event sense register 10-4
Table 10–7 Event sense inputs 10-4
Table 10–8 Mask port 10-5
Table 10–9 Register bank selection 10-5
Table 10–10 Digital I/O (I/O0–I/O31), registers 0–3, bank 0 (r/w) 10-6
Table 10–11 Mask register 10-6
Table 10–12 Event sense status 10-7
Table 10–13 Example of event sense register 10-8
Table 10–14 Event control register 10-8
Table 10–15 Event status register 0 10-9
Table 10–16 Event control register 1 10-9
Table 10–17 Bank select status register 10-10
Table 10–18 Debounce control register 10-10
Table 10–19 Debounce duration 10-11
Table 10–20 Debounce duration register 0 10-11
Table 10–21 Debounce duration register 1, port 2, bank 2 10-12
Table 10–22 Debounce duration register 1 10-12
Table 10–23 Bank select register 2 10-13
Table 10–24 Advanced control register 0 10-13
Table 10–25 Delta sense registers (0–5) 10-14
Table 10–26 Polarity event extended registers 10-15
Table 13–1 Ethernet LEDs 13-1
Table 15–1 W18 Power Fail Indicator jumper 15-1
Table 15–2 BX register values 15-2

Table 18–1 PC-680 BIOS setup Power Screen options 18-3
Table 19–1 POST Codes 19-4
Table 19–2 POST Codes (continued) 19-5
Table 19–3 POST Codes (continued) 19-6
Table 19–4 POST Codes (continued) 19-7
Table A–1 PC–680 memory map A-5
Table A–2 PC–680 I/O address map A-5
Table A–3 PC–680 jumper configurations A-6
Table A–4 PC–680 jumper configurations (continued) A-7
Table A–5 COM1 - COM6 serial ports A-8
Table A–6 LPT1 port A-9
Table A–7 Digital I/O port A-9
Table A–8 Connectors and mating recepticles A-10
Table A–9 Fan: J1 ..... A-11
Table A–10 Speaker: J2 ..... A-11
Table A–11 Power: J3 ..... A-11
Table A–12 Flat panel: J4 ..... A-12
Table A–13 Digital I/O: J5, J6 ..... A-13
Table A–14 COM1 / COM2: J7 ..... A-13
Table A–15 PC video: J8 ..... A-14
Table A–16 PC/104: J9 ..... A-15
Table A–17 COM3 / COM4: J10 ..... A-16
Table A–18 Floppy port: J11 ..... A-17
Table A–19 SVGA CRT: J12 ..... A-17
Table A–20 Battery: J13 ..... A-18
Table A–21 COM5 / COM6: J14 ..... A-18
Table A–22 Ethernet: J15 ..... A-18
Table A–23 USB: J16 ..... A-19
Table A–24 LPT: J17 ..... A-19
Table A–25 IDE hard drive: J18 ..... A-20
Table A–26 COM5 / COM6 - GPS: J19 ..... A-21
Table A–27 Keyboard / Mouse: J20 ..... A-21
Table D–1 Cables and terminal board D-1
Table D–2 LCD displays and keypads D-1
Table D–3 Miscellaneous part numbers D-1

Overview: Section 1 – Installation

Section 1 provides installation and programming instructions, startup options, and system configuration program examples. The following chapters are included:

Chapter 1: Overview
Chapter 2: Quick start
Chapter 3: SETUP programs
Chapter 4: Save and run programs

Chapter 1: *Overview*

≡ Description

The PC–680 Mobile Industrial Computer™ (MIC) is a high performance, single board PC in Octagon's product line. The PC–680 integrates serial communication, industrial digital I/O, floppy and PCI bus hard disk ports, a multifunctional parallel port, and PCI bus video that supports monitors and flat panels. This single–board computer has two solid–state disks, a PC/104 interface, and a 10BaseT/100BaseTX Ethernet port.

The PC–680 is available with a 166 MHz Pentium CPU for –40 to +80C operation or with a higher performance 266 MHz Pentium CPU. This board is supplied with DOS 6.22 in ROM but will also execute other operating systems such as LynxOS™, Windows 98™, Windows NT™, Windows CE™, and QNX®. Since the PC–680 uses the same functional blocks as the Micro PC™, the circuitry has been fully proven as reliable and the software is compatible with the software in the Micro PC series.

≡ PC–680 major hardware features

CPU

Two versions are available - a 166 MHz or 266 MHz low-voltage Pentium with MMX extensions. The PC–680 has a PCI bus speed of 33 MHz and an ISA bus speed of 8.33 MHz.

Up to 128 MB SDRAM

The PC–680 can hold up to 128 MB of SDRAM in a single SO–DIMM socket. All DIMM modules from Octagon meet the full PC–680 temperature range.

Solid–state disks

Two solid state disks, SSD0 and SSD1, are present on the PC–680. The flash file system allows both to be accessed as DOS compatible drives. SSD0 is optionally installed by the user.

SSD0

A 32–pin DIP socket accepts either an M–Systems DOC, 5V flash, SRAM, or 512 KB/1 MB EPROM. The socket exhibits high retention force and affords a gas tight contact. SSD0 is a user installed option.

SSD1

SSD1 contains the BIOS drive and ROM–DOS 6.22. Flash file system software is included which allows the SSDs to emulate hard disk operation.

Floppy and hard disk ports

The floppy disk port supports two standard floppy drives. The EIDE hard drive port supports two EIDE devices including hard drives and CD-ROM drive. The EIDE connector supplies +5V to a 2.5" hard drive.

Boot sequence

A PC–680 can be configured to boot from the solid–state disk, an external floppy, a hard disk, or CD.

Serial ports protected against ESD

The PC–680 has six serial ports with combinations of RS–232C, RS–422, RS–485, and TTL (for GPS modules) interfaces. These serial ports have the following common specifications:

- IEC1000, level 3, ESD protection specification
  - — Contact discharge ±6 kV
  - — Air–gap discharge ±8 kV
- Backdrive protection
- 16C550 compatible
- Up to 115.2K baud
- 16–byte FIFO buffers
- Enabled and disabled in BIOS SETUP

Multifunctional printer port

The PC–680 incorporates the latest enhanced parallel port. It includes the following features:

- Unidirectional
- Bidirectional
- IEEE 1284, ECP and EPP modes
- 14 mA of drive current
- Backdrive protection

The following represent applications in the multifunctional parallel port:

- LPT1 for PC compatible printers
- 17 general purpose digital I/O lines
- Up to a 4 x 4 matrix keypad
- 4–line alphanumeric display

Keypad and LCD display support for low cost operator interface

For embedded applications, the parallel printer port can interface with a 16–key matrix keypad and a 2– or 4–line LCD display. The PC–680 is supplied with software that provides keypad scanning and display operation. Supplied display and keypad drivers in C support these devices.

32–bit digital I/O with versatile configuration

The PC–680 has 32 lines of industrial, digital I/O. Each I/O is a terminated, bidirectional line that can be individually configured as an input, input with event edge sensing, input with level sensing, output, or output with readback. Inputs can generate interrupts or can be polled. The lines are 5V compatible and can sink 25mA. The I/O port can also drive the Octagon MPB series opto–isolation module (Opto 22, G4 style) racks directly, controlling AC and DC loads to 240V at 3A.

Each line has a 4.7kW termination resistor, ESD, and over/under shoot protection.

An interrupt can be generated from any of the 32 inputs. This interrupt can be enabled, disabled, and made to interrupt on a rising or falling event/edge.

USB

The PC–680 contains two Universal Serial Bus (USB) ports.

PCI bus XVGA, flat panel interface, and GUI accelerator

The video system on the PC–680 uses the advanced 69000 video controller from Chips & Technologies. It supports CRT, LCD and EL displays with resolutions to 1024 x 768 bpp x 16 (1280 x 1024 on some selected displays). Displays from CGA through XVGA are supported. The 69000 features a graphics accelerator with real time PC–video being supported. Since the video circuitry operates on the PCI bus at the full PCI bus speed, programs like Windows execute very rapidly. The video section has 2 MB of video SDRAM for high–resolution displays and simultaneous CRT and flat panel operation. The PC–680 supports 5V flat panel displays.

Adjustable display bias supply

An on–board voltage converter eliminates the need for a separate bias supply for the LCD contrast control. The standard range for the bias supply is from +23V to +29V.

Speaker, keyboard, and mouse ports

The speaker connector is PC compatible. The keyboard controller accepts an AT style keyboard and has a PS–2 type connector. The mouse port is combined with the keyboard port and is accessed with a "y" cable. Neither the keyboard nor the mouse are required for operation.

PC/104 16–bit interface

The PC/104 interface accepts an 8– or 16–bit PC/104 expansion board. PC/104 expansion boards are available from several manufacturers.

Ethernet

The PC–680 provides a 10BaseT/100BaseTX Ethernet port and supports the IEEE 802.3 Ethernet standard. The Ethernet controller IC chip provides the following:

- PCI interface
- 3 KB transmit buffer, 3 KB receive buffer
- Integrated 10 BaseT/100BaseTX transceiver interface
- Two LEDs for link and traffic status
- Auto negotiating between full and half–duplex modes
- Auto negotiating between 10Mbps and 100Mbps

Watchdog timer added for safety

The watchdog timer resets the system or generates an NMI (nonmaskable interrupt) if the program stops unexpectedly. The watchdog is enabled, disabled and strobed under software control. The time–out period is programmable from 0.5 to 60 seconds.

Hardware reset

A hardware reset ensures complete reset of the system and all attached peripherals. A hardware reset can be done by any of the following methods:

- An expired watchdog timer cycle
- Depressing the reset switch
- Cycling power

Real time calendar/clock with battery–backup

The real time clock is fully AT compatible and uses the standard DOS calls. An optional off–card battery powers the real time clock when the 5 volt supply is removed.

5 Volt operation lowers system cost

The PC–680 operates from a single 5V ±5% supply.

- 5V ±5%, approximately 1.6 to 3.0A (dependent upon processor type, speed and I/O devices), approximately 1A in standby
- +12V and –12V supplied to PC/104 connector and display connector; not required for PC–680 operation

Rugged environmental operation

■ Operating temperature	–40° to 70°C, Intel Pentium 266 MHz with heatsink and fan –40° to 85°C, Intel Pentium 166 MHz
■ Nonoperating temperature	–55° to 90°C, nonoperating
■ Relative humidity	5% to 95% noncondensing
■ Altitude	–100 to 10,000 m
■ Shock	40g, 3 axis
■ Vibration	6g, 3 axis

Size

5.75" x 8.0". Height is dependent on heatsink/fan selection

≡ PC–680 major software features

Advanced power management and system management input

Power management can be used to reduce power consumption. This reduces the heat load and extends the battery life in mobile applications.

Diagnostic software verifies system integrity automatically

The PC–680 has built–in diagnostic software that can be used to verify on–card I/O and memory functions. On powerup or reset, a series of tests are performed automatically. Memory verification does not require software, test equipment, monitor, keyboard, disks, or test fixtures.

BIOS SETUP information stored in EEPROM for high reliability

Loss of BIOS setup data is serious in industrial and mobile applications. Most PCs store the BIOS setup information in battery–backed CMOS RAM. If the battery fails or is replaced during routine maintenance, this information is lost. Without a keyboard and monitor in embedded applications, time consuming re–initialization is required. The PC–680 stores the BIOS setup information in EEPROM with 512 bytes available to the user. Software routines to use this available memory come with the PC–680.

Phoenix BIOS

The PC–680 has a Phoenix AT BIOS with power management and Octagon BIOS extensions.

"Instant DOS" operating system

Datalight ROM–DOS v6.22 operating system is in flash. This means that this version is always present on powerup. The system boots and operates the same way as a desktop PC. Since all software and hard-

ware are included, the system is fully operational "out of the box."

Programmable video BIOS

The flash contains a video BIOS, which controls the on–board XVGA controller. By default, the video BIOS supports a CRT only. To support flat panels, you can easily program in a new video BIOS.

On–board flash file system

The flash file system controls the on–board SSDs, which allows read/write DOS access to the flash/SRAM. SSD0 can also use EEPROM. For certain types of flash, the flash file system uses "wear leveling" to spread the usage and maximize the lifetime of these devices.

Octagon BIOS extensions

On–board BIOS extensions allow easy access to digital I/O, serial EEPROM, LCD bias control, watchdog timer functions, etc.

Chapter 2: Quick start

This chapter covers the basics of setting up a PC–680 system and tells you how to quickly install and power on the PC–680, and run a demo program.

If you need to establish a serial console link instead of using the monitor and keyboard, refer to the *Serial console* section in the *Console devices* chapter.

WARNING!

The PC–680 Mobile Industrial Computer contains static sensitive CMOS components. Do the following to avoid damaging your card and its components:

- Ground yourself before handling the PC–680 card
- Disconnect power before removing or inserting a PC/104 expansion board
- When programming a memory device, place the device in the socket before applying power.

≡ Configuration Jumpers

Before you continue with the installation of your PC–680, review the jumper configurations in Tables 2–1, 2–2, and the PC–680 diagram in Figure 2–1 to become familiar with the jumper functions and locations.

Table 2–1 PC–680 jumper configurations

Function	Reference Designator	Setting	Description
CPU Clock Ratio	W3	all removed	2/5 bus/core ratio
		3-4	for 266 MHz Intel Pentium **
		1-2, 3-4	2/3 bus/core ratio
		1-2	1/3 bus/core ratio
		5-6	1/4 bus/core ratio
		1-2, 3-4, 5-6	for 166 MHz Intel Pentium **
		3-4, 5-6	for 333 MHz AMD K6 **
CPU Core Voltage	W4	1-2, 5-6, 7-8	3.3V
		1-2, 3-4, 7-8	3.1V
		3-4, 7-8	3.0V
		1-2, 7-8	2.9V
		7-8	2.8V
		1-2, 3-4, 5-6	2.7V
		3-4, 5-6	2.6V
		1-2, 5-6	2.5V
		3-4	2.2V - 333 MHz AMD K6-2E **
		1-2	2.1V
		3-4, 5-6, 7-8, 9-10	2.0V
		5-6, 7-8, 9-10	1.9V - 166/266 MHz Intel Pentium **
		3-4, 7-8, 9-10	1.8V
Digital I/O Termination	W5	2-4	Bits 0-7 Pull up (+5V) *
		4-6	Bits 0-7 Pull down (GND) (Pin 4 nc for bits 0-7 float)
		1-3	Bits 8-15 Pull up (+5V) *
		3-5	Bits 8-15 Pull down (GND) (Pin 3 nc for bits 8-15 float)
		9-11	Bits 16-23 Pull up (+5V) *
		7-9	Bits 16-23 Pulldown (GND) (Pin 9 nc for bits 16-23 float)
		10-12	Bits 24-31 Pull up (+5V) *
		8-10	Bits 24-31 Pull down (GND) (Pin 8 nc for bits 24-31 float)
User Options	W7	1-2	"B" BIOS device on=SSD1 *, off=SSD0
		3-4	"X" Extended BIOS on=enabled *, off=disabled
		5-6	Unused
		7-8	"P" protected BIOS on= protected *, off= unprotected
		9-10	"S" use SETUP selections *

* = default
** = board dependent

Table 2–2 PC–680 jumper configurations (continued)

Function	Reference Designator	Setting	Description
COM3 Configurations	W12	3-4, 5-6, 7-8 , 9-10	RS-232 *
	W13	1-2, 3-4, 7-9, 8-10	RS-422 w/o termination
	W12	1-2	RS-422 with termination
	W13	1-2, 3-4, 7-9, 8-10	
	W8	1-2, 3-4	RS-485 w/o termination
	W13	7-9, 8-10	
	W8	1-2, 3-4	RS-485 with termination
	W12	11-12	
	W13	7-9, 8-10	
COM4 Configurations	W10	3-4, 5-6, 7-8, 9-10	RS-232 *
	W11	1-2, 3-4, 7-9, 8-10	RS-422 w/o termination
	W10	1-2	RS-422 with termination
	W11	1-2, 3-4, 7-9, 8-10	
	W6	1-2, 3-4	RS-485 w/o termination
	W11	7-9, 8-10	
	W6	1-2, 3-4	RS-485 with termination
	W10	11-12	
	W11	7-9, 8-10	
Power Fail Indicator	W18	1-3	System Reset *
		3-4	NMI
SSD0 Device Type	W20	2-4	All others (see W21)
		3-4	SRAM *
SSD0 Device Type	W21	1-2, 5-7, 9-10	Flash
		5-7	DOC
		1-2, 4-6, 8-10	SRAM *
		1-3, 2-4, 9-10	EEPROM
GPS Antenna Power	W24	1-2	+5V *
		2-4	+12V
User Option	W26	1-2	User option jumper *
Video	W26	3-4	on = use on board video * off = disable on-board video

* = default

≡ Installing the PC–680

Installation

To install the PC–680 you will need the following equipment (or equivalent):

- PC–680 Mobile Industrial Computer
- +5V power supply - see *Power Supply Requirements* section
- AT compatible keyboard with PS/2 connector
- VGA monitor
- VGA–12 cable (p/n #4565)

Hardware components required to mount the PC–680 (not included):

- 8 threaded hex stainless steel standoffs (4–40 x 3/8")
- 8 screws (4–40 x 1/4")
- 8 internal star lock washers (#4)

Refer to the PC–680 component diagram, Figure 2–1, for the location of various connectors, and to the mounting hole diagram, Figure 2–2, for installing your PC–680 system.

Speaker

If required, you can interface a speaker via a 4–pin connector at J2. You may use any external speaker from 8–50 ohms. Refer to figure 2–1 for the location of J2.

Keyboard and mouse

The PC-680 accepts an AT style keyboard and has a PS/2 type connector, located at J20. The mouse port shares the keyboard connector.

To use a keyboard, plug the keyboard directly into J20.

To connect a mouse, use a laptop style "y" cable, available at computer stores, that which splits the J20 signals into keyboard and mouse connectors.

Note See *Appendix A - Connectors* for mating information.

Figure 2-1 PC-680 component diagram

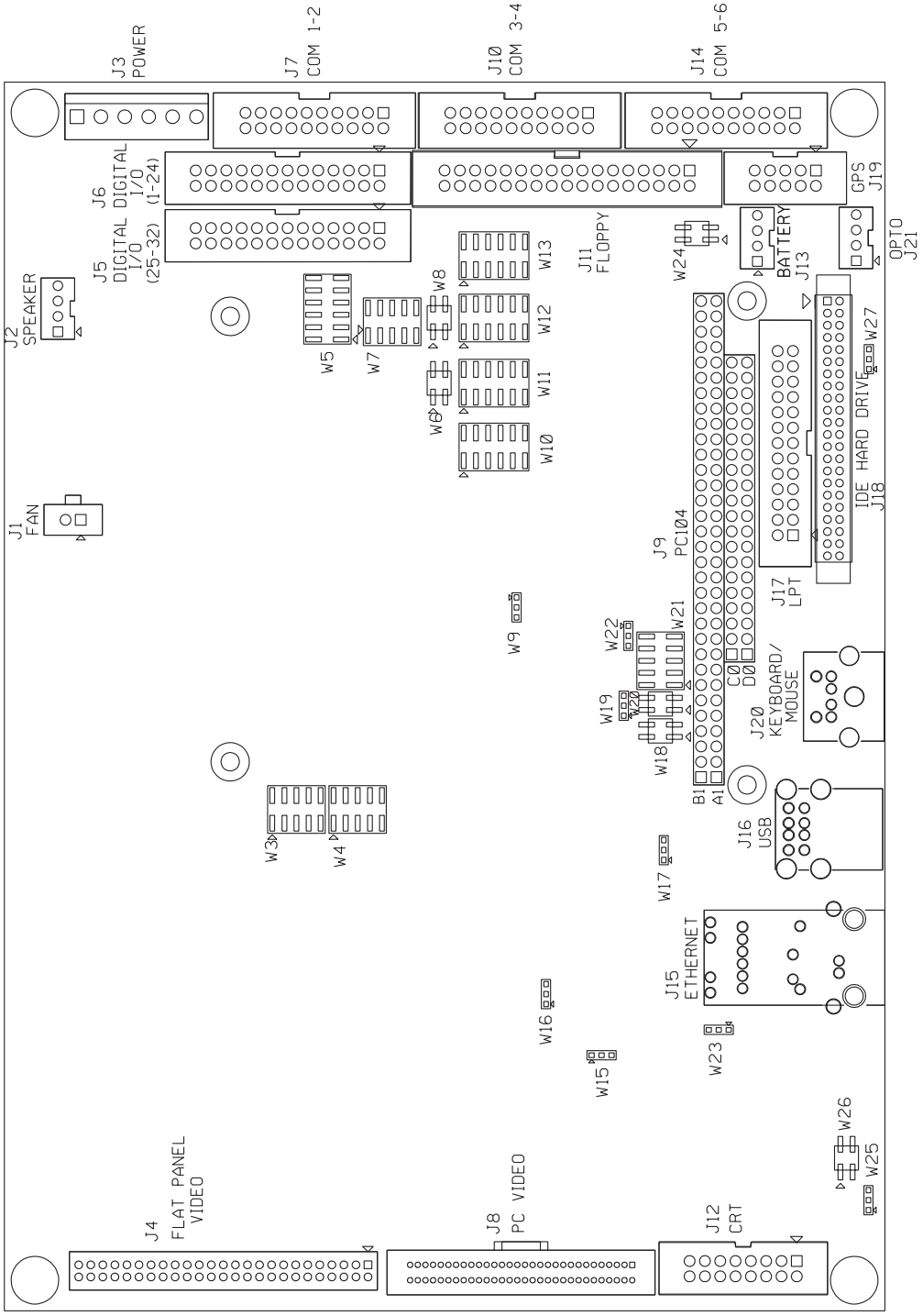
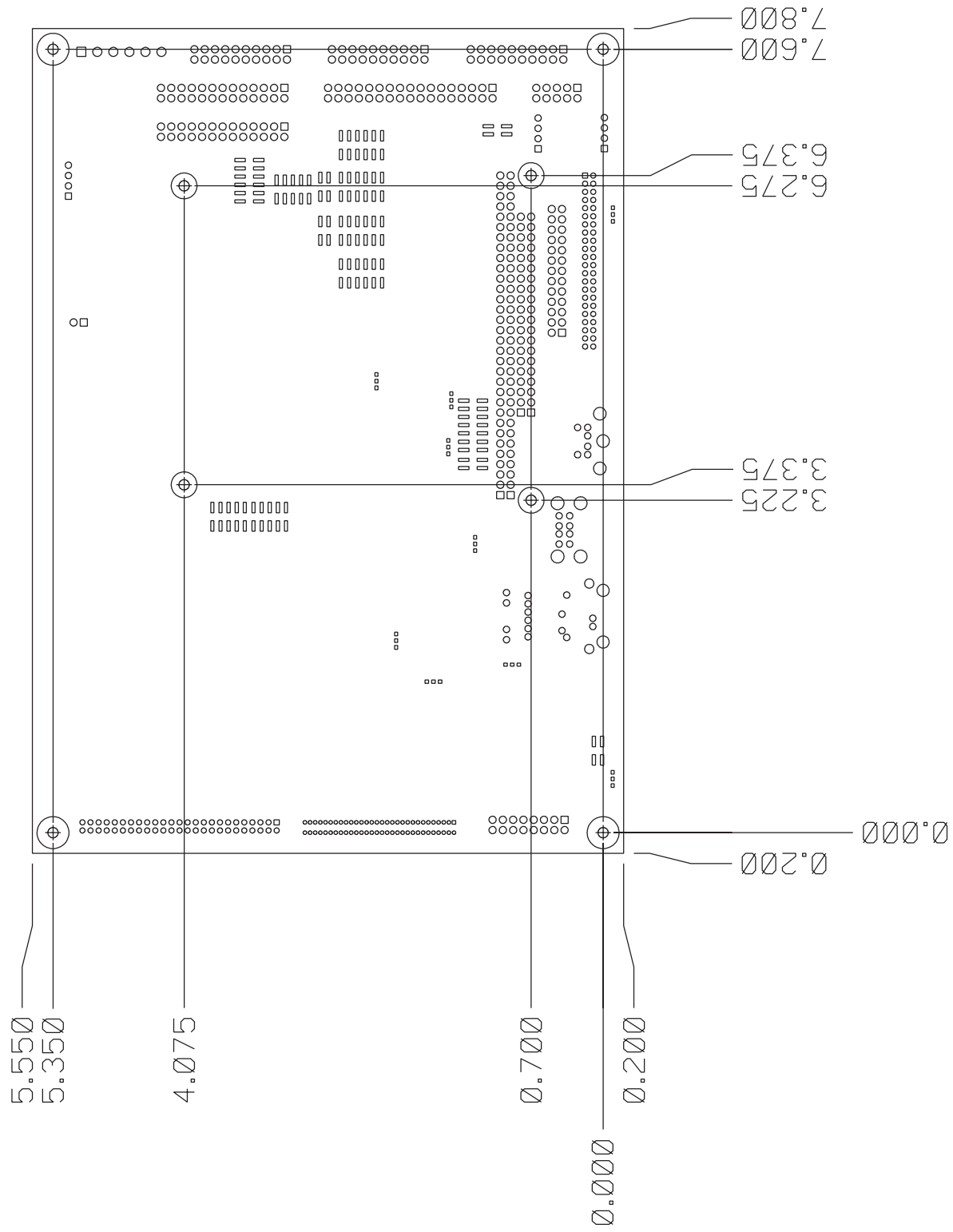


Figure 2-2 PC-680 center-to-center mounting hole diagram



1. Use the standoffs, washers, and screws and place them in the eight holes on the PC–680 board. Refer to Figure 2–2 for the center–to–center mounting hole dimensions and for the location of the designated holes used for mounting the hardware.

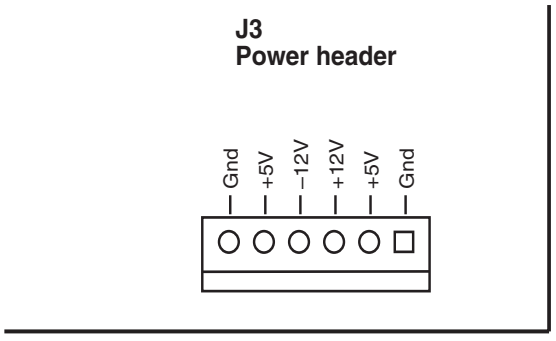
> **WARNING!**
>
> All eight standoffs, screws and washers must be used to secure the PC–680. The standoffs will ensure full support not only on all four sides, but also in the middle of the board. This will reduce circuit board flex when a PC/104 expansion board or SSD0 device is inserted.
>
> In high vibration and shock environments, the standoffs are required to avoid damage to the electronic components and circuit board traces.

2. Connect a 5V power source to the PC–680. Refer to the *Power Supply Requirements* section. If you are using a PC/104 expansion card, you may also require a ±12V source.

   The power supply connector is located at J3. Refer to Figure 2–3. Make certain to use both +5V connections and both ground connections. This is required for proper operation.

> **WARNING!**
>
> Accidently crossing the wires, i.e., plugging +5V wires into the ground connector or the ground wires into the +5V connector will damage the PC–680.

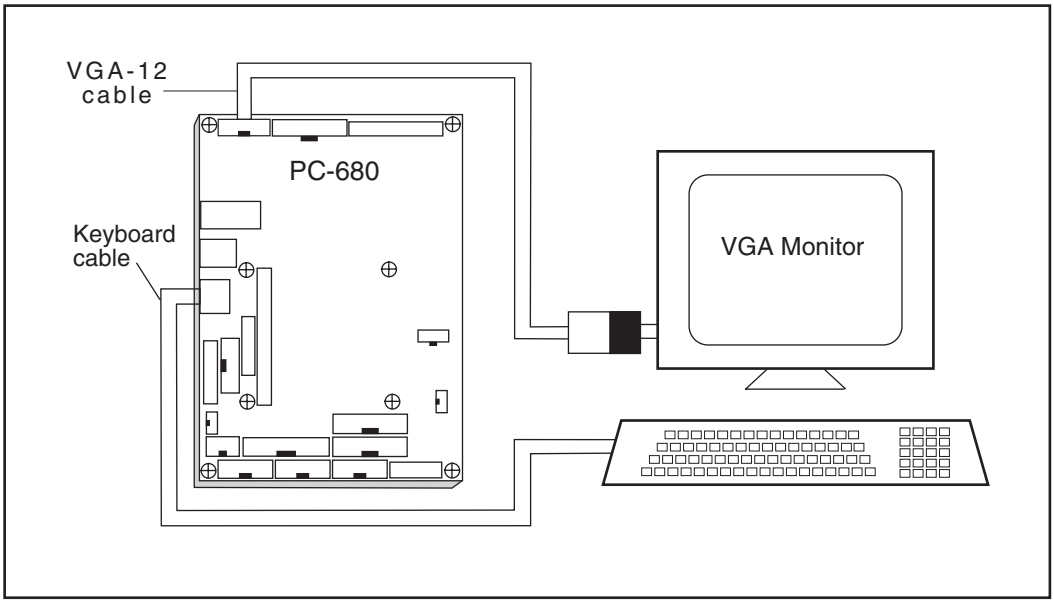
Figure 2–3 Power connector



Note See *Appendix A - Connectors* for mating information.

3. Connect the PS–2 style keyboard directly to the keyboard port at J20 and a VGA monitor to J12 using a VGA–12 cable. Refer to Figure 2–4.

Figure 2–4 Keyboard and monitor connections



≡ PC–680 power supply requirements

The PC–680 is designed to operate from a single +5 VDC supply, connected at J3. The typical current requirements for the PC–680 is listed in the *Technical data* appendix. If you are using the PC/104 interface, you may also require ±12 VDC. Make sure that you utilize both +5 VDC conductors and both ground conductors.

The user should also consider other factors such as the power cable conductor gauge, number and length of conductors, mating connectors, and the power supply to external devices such as hard drives, floppy drives, displays, mouse, and keyboard.

It is important that a quality power supply be used with the PC–680 that has sufficient current capacity, line and load regulation, hold up time, current limiting, and minimum ripple.

The power supply for the PC–680 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This ensures that all the circuitry on the PC-680 sequences properly and avoids system lockup.

Also, select a power supply that discharges quickly. If large power supply output capacitors are used, powering the system down and then up may lock up the PC–680. If the power supply does not drain below 0.7V, the CMOS components on the PC–680 will act like diodes and forward bias, potentially damaging the PC–680 circuitry.

The proper selection of a quality power supply ensures reliability and proper functioning of the PC–680.

WARNING!

Make sure the power supply is OFF when connecting the power cable to the PC–680 board. Damage to the PC–680 may occur if the power is ON when connecting the power cable.

≡ Running a demo program

Logon message

1. Power on the PC–680.
2. A logon message similar to the one below appears on your PC monitor:

```
PhoenixBIOS 4.0 Release 6.0
Copyright 1985-1998 Phoenix Technologies Ltd.
All Rights Reserved
Octagon Release: VX.14B-2/3/00
Build Time: 10/13/99 10:37:31

CPU = Pentium(R)MMX(TM)  166 MHz
640K System RAM Passed
64512K Extended RAM Passed
0512K Cache SRAM Passed
System BIOS shadowed
Video BIOS shadowed
UMB upper limit segment address: E8B8

Press <F2> to enter BIOS setup

PC-680 INT 17h BIOS extension v1.15 Copyright © 1995-
2000, Octagon Systems
FlashFX 4.01.153 (386 DOS)
Copyright © 1993-1998, Datalight Inc.
Datalight Patent Pending
Octagon Systems V2.01 – PC-680
SETSSD SSD1 /BEFORE
4Mb Strata Flash detected in SSD1
```

```
Starting ROM-DOS...


PC680 C:\> demo
```

Then a demonstration program will begin.

```
Press any key to continue
```

3. Use the directory command to make sure your equipment and software are working properly. Enter:

```
PC680 C:\> DIR
```

A similar directory listing of files stored in the SSD1 device should be displayed:

```
Volume in drive C is SSD1
Volume Serial Number is 3214-1BE4
Directory of C:\

COMMAND    COM   26,321   04-12-96   6:22p
AUTOEXEC   BAT       38   04-12-96   8:26p
CONFIG     SYS       67   04-12-96   8:26p
DOS        <DIR>          04-12-96   8:26p
UTILS      <DIR>          04-12-96   8:26p
DEMO.EXE   EXE   27,922   04-12-96   8:26p
DEMO       BAS    5,045   04-12-96   8:26p
             7 file(s)   26,426 bytes
                         105,472 bytes free
```

If you do not get the proper logon message, please do the following:

- Make sure all jumpers are set to factory defaults. Refer to Tables 2–1 and 2–2 for the default jumper settings.
- If the system still does not respond, remove W26[3–4] to use the default BIOS setup and try again. Also, refer to the *Troubleshooting* chapter.

≡ What's next

1. To run BIOS setup and configure the system, see the *BIOS setup* chapter.
2. To connect a floppy and/or hard drive, see the *External drives* chapter.
3. To use a serial console, refer to the *Console devices* chapter.
4. To transfer files from a host PC and/or to use a remote disk via a serial connection, refer to the *Console devices* chapter

Chapter 3: BIOS setup

≡ Introduction

Two system configuration programs exist for the PC–680. They are:

- BIOS setup — Configures devices set up by the BIOS such as serial ports, floppy drives, power management, etc.
- SETSSD.EXE — Configures boot order for the SSD devices. For information on SETSSD.EXE, refer to the *Managing SSDs* section in the *SSDs, DRAM, and battery backup* chapter.

≡ BIOS setup

The BIOS is shipped with default configuration parameters stored in the serial EEPROM. BIOS setup defines the PC–680 system parameters. System parameter changes are made by entering the BIOS setup program.

- BIOS setup is entered by pressing the F2 key during BIOS POST sequence (this occurs between the memory test and boot).

Refer to Tables 3–1, 3–2, 3–3, 3–4, 3–5, and 3–6 for a list of setup options.

Running BIOS setup

1. To run BIOS setup make sure you have installed a keyboard and monitor with the PC–680 *or* a establish a serial communications link between the PC–680 and your PC. See the *Console devices* chapter for more information on these two options.
2. During the BIOS POST sequence (this occurs between the memory test and boot) press the F2 key .

   ```
   Press <F2> to enter SETUP
   ```

Table 3–1 PC–680 BIOS setup parameters

BIOS Setup	Options / Defaults
Main Screen	
Setup Parameters	
Legacy Diskette A: Legacy Diskette B:	Disabled * (drive B is disabled) 360 KB 5 ¼" 1.2 MB 5 ¼" 720 KB 3½" 1.44/1.25 MB 3½" * (drive A is enabled) 2.88 MB 3½"
Primary Master Primary Slave	Type: None Auto * (applies to both master and slave) CD-ROM User
Type:	
Auto	
32 Bit I/O:	Disabled * Enabled
User	
Cylinders: Heads: Sectors:	0 - 65535 1 - 16 0 - 63
User and CD-ROM	
Multi-Sector Transfers:	Disabled * 2 Sectors, 4 Sectors, 8 Sectors, 16 Sectors
LBA Mode Control:	Disabled * Enabled
32 Bit I/O:	Disabled * Enabled
Transfer Mode:	Standard * Fast PIO 1, Fast PIO 2, Fast PIO 3, Fast PIO 4, Fast PIO 3 / DMA 1 , Fast PIO 4 / DMA 2
Ultra DMA Mode:	Disabled * Mode 0 , Mode 1, Mode 2, Mode 3, Mode 4
Memory Cache	Enabled * Disabled
Cache System BIOS area:	Enabled * Disabled
Cache Video BIOS area:	Enabled Disabled *
QuickBoot Mode:	Disabled * Enabled
Summary screen:	Disabled * Enabled
Enable SSD0 Scan:	Disabled * Enabled

* = default

Table 3–2 PC–680 BIOS setup parameters (continued)

BIOS Setup	Options / Defaults
Advanced Screen	
Setup Parameters	
Local Bus IDE adapter:	Enabled * Disabled
Floppy disk controller:	Enabled * Disabled
Base I/O address:	Primary * Secondary
PS/2 Mouse:	Auto Detect * Disabled Enabled
Parallel port:	Auto * Disabled Enabled
Mode:	Bi-directional * EPP mode ECP mode Output only
Base I/O address:	378h *, 278h, 3BC
	IRQ 7 *, IRQ 5
Serial port A:	Enabled * Auto Disabled
Base I/O address:	3F8h *, 2F8h, 3E8h, 2E8h
Interrupt:	IRQ 4 *, IRQ 3
Serial port B:	Enabled * Auto Disabled
Base I/O address:	2F8h *, 3E8h, 2E8h, 3F8h
Interrupt:	IRQ 3 *, IRQ 4
Serial port C:	Enabled * Auto Disabled
Interrupt:	None, IRQ 9, IRQ 10 *, IRQ 11
Serial port D:	Enabled * Auto Disabled
Interrupt:	None, IRQ 9, IRQ 10 *, IRQ 11
Serial port E:	Enabled * Auto Disabled
Interrupt:	None, IRQ 9, IRQ 10, IRQ 11 *
Serial port F:	Enabled * Auto Disabled
Interrupt:	None, IRQ 9, IRQ 10, IRQ 11 *

* = default

Table 3–3 PC–680 BIOS setup parameters (continued)

BIOS Setup	Options / Defaults
Advanced Screen (continued)	
Setup Parameters	
Digital I/O:	Enabled * Disabled
Base I/O address:	100h, 120h *
Ethernet IRQ	Auto Select * 3, 4, 5,7, 9, 10, 11, 12, 14, 15 Disabled
PCI Configuration	
ISA graphics device installed	No * Yes
PCI/PNP ISA UMB Region Exolusion:	
C800 - CBFF:	Available * Reserved
CC00 - CFFF:	Available * Reserved
D000 - D3FF:	Available Reserved *
D400 - D7FF:	Available Reserved *
D800 - DBFF:	Available * Reserved
DC00 - DFFF:	Available * Reserved
PCI/PNP ISA IRQ Resource Exclusion:	
IRQ 3:	Available * Reserved
IRQ 2:	Available * Reserved
IRQ 5:	Available * Reserved
IRQ 7:	Available * Reserved
IRQ 9:	Available * Reserved
IRQ 10:	Available * Reserved
IRQ 11:	Available * Reserved
IRQ 15:	Available * Reserved
Serial Video:	Disabled * Enabled
Baud Rate:	9600, 19.2K, 38.4K *, 57.6K, 115K
Installed O/S:	Other Win95
Large Disk Access Mode:	Other DOS *
Reset Configuration Data:	No * Yes
Secured Setup Configurations:	No * Yes

* = default

Table 3–4 PC–680 BIOS setup parameters (continued)

BIOS Setup	Options / Defaults
Power Screen	
Setup Parameters	
Power Savings:	Disabled * Customized Maximum Power Savings Maximum Performance Enabled
Customized	
Idle Mode:	Off * On
Standby Timeout:	Off * 1 Min., 2 Min., 4 Min., 6 Min., 8 Min., 12 Min., 16 Min.
Auto Suspend Timeout:	Off * 5 Min., 10 Min., 15 Min., 20 Min., 30 Min., 40 Min., 60 Min.
Hard Disk Timeout:	Disabled * 10 Sec., 15 Sec., 30 Sec., 45 Sec., 1 Min., 2 Min., 4 Min., 6 Min., 8 Min., 10 Min., 15 Min.
Resume On Modem Ring:	Off * On Enabled
Maximum Power Savings	Off * On Enabled
Maximum Performance	Off On * Enabled
Thermal Setpoint (C) :	0 - 255
Hysteresis Setpoint (C):	0 - 255
Throttled Speed:	Disabled 12.5%, 25%, 37.5%, 50% *, 62.5%, 75%, 87.5%
Fan Control:	Disabled * Enabled
Watchdog Mode:	Disabled * Enabled
Watchdog Delay:	8.0 sec. *, 16.0 sec., 32.0 sec., 64.0 sec.

* = default

Table 3–5 PC–680 BIOS setup parameters (continued)

BIOS Setup
Boot Screen
Setup Parameters
+Removable Devices
Legacy Floppy Drives
+Hard Drive
Bootable Add-in Cards
ATAPI CD-ROM Drive
Network Boot

Table 3–6 PC–680 BIOS setup parameters (continued)

BIOS Setup
Exit Screen
Exit Options
Exit Saving Changes
Exit Discarding Changes
Load Setup Defaults
Discard Changes
Save Changes

Chapter 4: *Save and run programs*

≡ Save and run your programs on the PC–680

Once you have written, tested and debugged your application, you can then save it to flash memory in SSD1 or SSD0 (if you have flash, DOC, or SRAM installed). When you reboot the PC–680, your program can automatically execute. As shipped from the factory, SSD1 already contains a bootable ROM–DOS.

This chapter describes the following:

- Saving an application program to SSD1
- Autoexecuting the program from the PC–680
- Overriding autoexecution of your program

The information in this chapter assumes you are using ROM–DOS in your application. Some Microsoft programs make undocumented DOS calls. With ROM–DOS, an error returns when an undocumented DOS call is made, causing your program to operate erratically. We recommend booting from SSD0 using your own DOS, when using programs with undocumented DOS calls.

≡ Saving programs and support files

By default, the drive in SSD1 comes preformatted from the factory, loaded with ROM–DOS, startup files and an example demo program. To replace the demo program on SSD1 with your own, see the section *Adding your application*, in this chapter. To reformat an SSD or to add your own operating system, please refer to the *SSDs, DRAM, and battery backup* chapter.

WARNING!

Reformatting SSD1 requires the use of a floppy or a hard disk to restore system files.

Adding your application

To add your application to your SSD, do the following:

1. Three methods of copying your application to the SSD are available. Do one of the following:
   - From a local drive on the PC–680, such as A: or C:, use the COPY command to copy your application program to the SSD.
   - From a host PC using a terminal emulator, serially download your application program by using the TRANSFER command. Refer to the *SSDs, DRAM, and battery backup* chapter.
   - From a host PC, establish a remote drive and copy your application program from it, using the REMDISK and REMSERV commands. Refer to the *SSDs, DRAM, and battery backup* chapter.
2. Also copy any device drivers required for your application to the SSD. CONFIG.SYS on the SSD may require modification to include the device drivers.
3. To autoexecute your application, add your application name to the AUTOEXEC.BAT file on the SSD. To replace the Octagon example program (DEMO.EXE) with your application, substitute DEMO in the AUTOEXEC.BAT file with your application program filename.

Note For information on CONFIG.SYS and AUTOEXEC.BAT, refer to your DOS manual.

Autoexecuting your application from SSD1

1. SSD1 is the default boot device, drive C:. After adding your program information to SSD1, including any required CONFIG.SYS files and modifying AUTOEXEC.BAT to run your application file, reset the system. Your application should begin execution.

Autoexecuting your application from SSD0

1. SSD0 first needs to be defined as the boot device, drive C:. After adding your program information to SSD0, including any required CONFIG.SYS files and modifying AUTOEXEC.BAT to run your application file, use the SETSSD command to define SSD0 as the boot device. Enter the following command:

   ```
   PC680 C:\> SETSSD SSD0 SSD1 /before
   ```

2. Reset the system. SSD0 is now drive C: and your application should begin execution.

Note It is recommended that you leave SSD1 in the SETSSD options or that you have a copy of SETSSD.EXE on SSD0. This allows you to change your boot device back to SSD1 if needed.

Overriding the autoexecution of your application

You may stop the autoexecution of your application by performing one of the following options:

Option 1

1. Press <Ctrl> C when the system boots to stop AUTOEXEC.BAT.
2. Change AUTOEXEC.BAT and/or CONFIG.SYS to **not** call out your program.

Option 2

1. Install a floppy drive.
2. Change BIOS setup to enable the floppy drive and to boot from it. Refer to the *BIOS setup* chapter.
3. Reset the system and boot from floppy using a bootable disk.
4. Change AUTOEXEC.BAT and/or CONFIG.SYS on C: to **not** call out your program.

Option 3

1. Remove the "S" jumper, W7[9-10].
2. When prompted, press "1" for SSD1, then "O" for other, then "Y" to save. then "Y" to abort CONFIG.SYS and AUTOEXEC.BAT.
3. Change AUTOEXEC.BAT and/or CONFIG.SYS to **not** call out your program.

Overview: Section 2 – Hardware

Section 2 discusses usage, functions, and system configurations of the PC-680's major hardware features. The following chapters are included:

Chapter 5:	Serial ports
Chapter 6:	LPT1 parallel port
Chapter 7:	Console devices
Chapter 8:	SSDs, DRAM, and battery backup
Chapter 9:	External drives
Chapter 10:	Digital I/O
Chapter 11:	CRTs and flat panels
Chapter 12:	PC/104 expansion
Chapter 13:	USB
Chapter 14:	Ethernet

Chapter 5: Serial ports

≡ Description

The PC–680 has six serial ports, COM1 through COM6. These serial ports interface to a printer, terminal, GPS (Global Positioning System) receiver, or other serial device. All ports support 5–, 6–, 7–, or 8–bit word lengths, 1, 1.5, or 2 stop bits, and baud rates up to 115.2K.

COM1 and COM2 are dedicated 8–wire RS–232 ports. COM3 and COM4 can be configured with jumpers to provide RS–232C, RS–422, or RS–485. COM5 and COM6 provide 4–wire RS–232 or GPS and RTCM SC–104 differential correction signal interfaces.

All serial ports have the following specifications:

- 16C550 compatible
- 16–byte FIFO buffers
- IEC 1000, level 3, ESD protection
  - — Contact discharge ±6 kV
  - — Air–gap discharge ±8 kV
- Backdrive protection
- Up to 115.2K BPS operation

The following sections describe these ports in more detail.

≡ Serial port configurations

Table 5–1 shows the configurations available for the COM ports.

Table 5–1 COM port configurations

COM Port	Port Type	Handshake Lines	I/O Address	Interrupt	Connector
COM1	RS-232	8 lines, ground	2E8h 2F8h 3E8h 3F8h*	IRQ3 IRQ4*	J7 (shared with COM2)
COM2	RS-232	8 lines, ground	2E8h 2F8h* 3E8h 3F8h	IRQ3* IRQ4	J7 (shared with COM1)
COM3	RS-232* RS-422 or RS-485	4 lines, ground	3E8h	IRQ9 IRQ10* IRQ11 or no IRQ	J10 (shared with COM4)
COM4	RS-232* RS-422 or RS-485	4 lines, ground	2E8h	IRQ9 IRQ10* IRQ11 or no IRQ	J10 (shared with COM3)
COM5	RS-232* or TTL levels for GPS	4 lines, ground	320h	IRQ9 IRQ10 IRQ11* or no IRQ	J14 - RS-232, J19 - GPS TTL (shared with COM6)
COM6	RS-232* or RTCM SC-104 for GPS	4 lines, ground	328h	IRQ9 IRQ10 IRQ11* or no IRQ	J14 - RS-232, J19 - GPS RTCM (shared with COM5)

* = default

Note Addresses and IRQs are selected in BIOS setup, port type is selected by jumpers.

Note IRQ9, 10, and 11 may be shared between COM3, COM4, COM5, and COM6. The application software must be able to differentiate the shared interrupt. Operating systems such as Windows NT configuration options for this.

COM1 / COM 2

COM1 and COM2 are 8–wire RS–232 ports.

Table 5–2 shows the pinout for COM1 and COM2 on J7.

Table 5–2 COM1 and COM2 pinout (J7 connector)

Port	Pin	RS-232C	Port	Pin	RS-232C
	1	DCD		11	DCD
	2	DSR		12	DSR
	3	RXD		13	RXD
	4	RTS		14	RTS
COM1	5	TXD	COM2	15	TXD
	6	CTS		16	CTS
	7	DTR		17	DTR
	8	RI		18	RI
	9	GND		19	GND
	10	NC		20	NC

Note See *Appendix A - Connectors* for mating information.

COM3 / COM 4

COM3 and COM4 can each be configured as a 4–wire industrial RS–232 interface, RS–422, or RS–485 interface. The IRQ for either port is selected through BIOS setup.

COM3 and COM4 use the RTS pin to enable or disable the RS–485 transmit/receive function.

COM3 and COM4 may "share" an interrupt with COM5 and COM6. The application software must be able to differentiate the shared interrupt. Operating systems such as Windows NT configuration options for this.

For more information, see the *COM3 through COM6 interrupt/status register* section and *COM3 / COM4 - RS-422 and RS-485* section in this chapter.

Table 5–3 shows the pinout for COM3 and COM4 on J10.

Table 5–4 shows the jumper selections for COM3 and COM4.

Table 5–3 COM3 and COM4 pinout (J10 connector)

Port	Pin	RS-232C	RS-422	RS-485
	1		TX+	DATA+
	2		TX–	DATA–
	3	RXD		
	4	RTS		
COM3	5	TXD		
	6	CTS		
	7		RX+	
	8		RX–	
	9	GND	GND	GND
	10	NC	NC	NC
	11		TX+	DATA+
	12		TX–	DATA–
	13	RXD		
	14	RTS		
COM4	15	TXD		
	16	CTS		
	17		RX+	
	18		RX–	
	19	GND	GND	GND
	20	NC	NC	NC

Note See *Appendix A - Connectors* for mating information.

Table 5–4 COM3 and COM4 jumper configurations

Port	Description	Reference Designator	Setting
COM3 Configurations	RS-232	W12	3-4, 5-6, 7-8, 9-10 *
	RS-422 w/o termination	W13	1-2, 3-4, 7-9, 8-10
	RS-422 with 100 ohm termination resistor	W13 W12	1-2, 3-4, 7-9, 8-10 1-2
	RS-485 w/o termination	W8 W13	1-2, 3-4 7-9, 8-10
	RS-485 with 120 ohm termination resistor	W8 W12 W13	1-2, 3-4 11-12 7-9, 8-10
COM4 Configurations	RS-232	W10	3-4, 5-6, 7-8, 9-10 *
	RS-422 w/o termination	W11	1-2, 3-4, 7-9, 8-10
	RS-422 with 100 ohm termination resistor	W11 W10	1-2, 3-4, 7-9, 8-10 1-2
	RS-485 w/o termination	W6 W11	1-2, 3-4 7-9, 8-10
	RS-485 with 120 ohm termination resistor	W6 W10 W11	1-2, 3-4 11-12 7-9, 8-10

* = default

COM5

COM5 can be used either as an industrial 4–wire RS–232 or as a TTL Global Positioning System (GPS) module port. The IRQ is selected through BIOS setup.

For RS–232, COM5 and COM6 share J14. When used for GPS, the 10–pin header at J19 is used for a TTL–level GPS module. The signals are hardwired to both J14 and J19. If you connect an RTCM SC–104 differential correction data GPS module to J19, you cannot use J14 for RS–232 on COM 5 or COM6. However, if you connect a GPS module that does not use differential correction data, you can still use COM6 for RS–232.

For more information, see the *COM3 through COM6 interrupt/status register* section in this chapter.

Table 5–5 shows the pinouts for COM5 and COM 6 on J14. Table 5–6 shows the pinouts for COM5 and COM6 on J19.

COM6

COM6 can be used either as an industrial 4–wire RS–232 or to route the RTCM SC–104 differential correction data to the GPS receiver. The IRQ is selected through BIOS setup.

For RS–232, COM5 and COM6 share J14. When used for GPS, the 10–pin header at J19 is used for a TTL–level GPS module. The signals are hardwired to both J14 and J19. If you connect an RTCM SC–104 differential correction data GPS module to J19, you cannot use J14 for RS–232 for COM5 or COM6. However, if you connect a GPS module that does not use differential correction data, you can still use COM6 for RS–232.

For more information, see the *COM3 through COM6 interrupt/status register* section in this chapter.

Table 5–5 shows the pinouts for COM5 and COM6 on J14. Table 5–6 shows the pinouts for COM5 and COM6 on J19.

Note See *Appendix A - Connectors* for mating information.

Table 5–5 COM5 and COM6 pinouts for RS-232 (connector J14)

Port	Pin	RS-232C	Port	Pin	RS-232C
	1	nc		11	nc
	2	nc		12	nc
	3	RXD		13	RXD
	4	RTS		14	RTS
COM5	5	TXD	**COM6**	15	TXD
	6	CTS		16	CTS
	7	nc		17	nc
	8	nc		18	GND
	9	GND		19	nc
	10	nc		20	nc

Global Positioning System Interface

COM5 and COM6 provide 4–wire RS–232 or GPS and RTCM SC–104 differential correction signal interfaces. J19 provideds the TTL signals necessary for a GPS receiver. Refer to table 5-10 for J19 pinouts.

Table 5–6 COM5 and COM6 pinouts for GPS (connector J19)

Port	Pin	Signal	Port	Pin	Signal
COM6	1	TxD (RTCM SC-104)		6	nc
COM6	2	RxD (RTCM SC-104)	COM5	7	DTR
COM5	3	RxD		8	nc
COM5	4	RTS		9	Gnd
COM5	5	TxD		10	Antenna power *

* The jumper at W24 selects the voltage for a GPS antenna. For a 5V antenna, position the jumper across pins 1-2 (default). For a 12V antenna, position the jumper across pins 2-4. For a passive antenna, leave W24 jumper off or on one pin only.

COM3 through COM6 interrupt/status register

COM3 through COM6 share the same interrupts—IRQ9, IRQ10, IRQ11, or no IRQ. The interrupts for these ports are specified in the BIOS setup menu. You can use the same interrupt for COM3 through COM6, or specify separate interrupts.

To determine which serial port caused the interrupt, read the interrupt status register from within your interrupt handler. Bit 3 through bit 6 show which serial port caused the interrupt.

Table 5–7 Interrupt status register

Port	Base address	Interrupt Status Register address	Bit	If bit = 1
COM3	3E8h	20Ch	0	COM3 interrupt pending
COM4	2E8h	20Ch	1	COM4 interrupt pending
COM5	320h	20Ch	2	COM5 interrupt pending
COM6	328h	20Ch	3	COM6 interrupt pending

Note All 0s indicate that there are no interrupts pending.

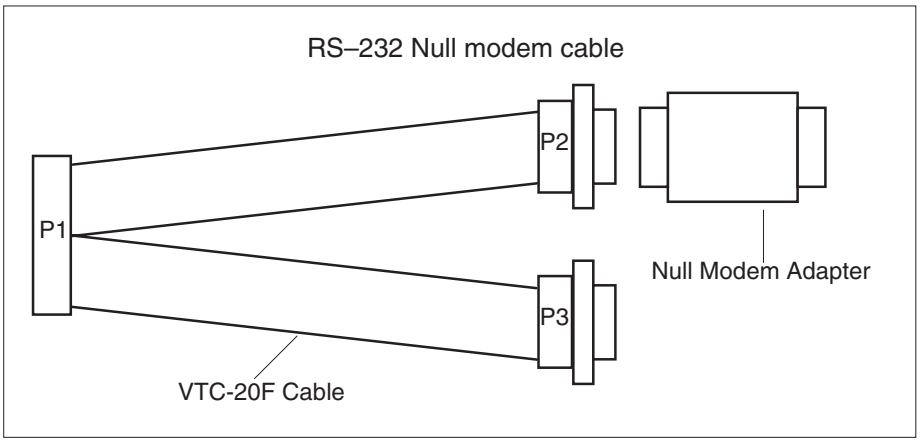
≡ Function and use of serial ports

COM1 as serial console device

Instead of using the on–board XVGA to connect a monitor, you can use COM1 as a console device. See the *Console devices* chapter for more information.

When interfacing the PC–680 to your desktop PC, you must use a VTC-20F cable and a null modem adapter.

Figure 5–1 Null modem adapter and VTC–20F cable



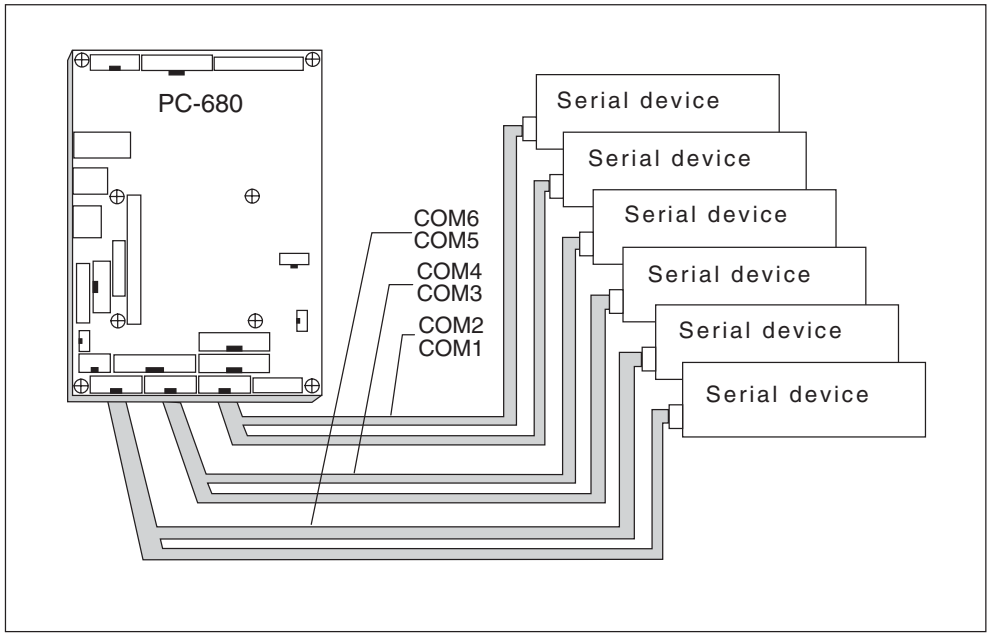
Mating cables

Use a VTC–20F or VTC–20M cable to connect the COM ports to external serial equipment. The P2 and P3 connectors are DB–9 female (VTC–20F) or DB–9 male (VTC–20M) connectors which plug directly into a 9–pin PC serial cable.

COM1 through COM6 as RS–232 I/O

COM1 through COM6 can be used as RS–232 serial ports. COM1 and COM2 support 8–wire configurations, while COM3 through COM6 are 4–wire only configurations. Use a VTC–20F or VTC–20M cable to interface from the PC–680 to the serial device. Refer to Figure 5–2.

Figure 5–2 PC-680 serial devices



COM3 / COM4 - RS–422, and RS-485

COM3 and COM4 can be configured as RS–232 (default), 4–wire RS–422, or 2–wire RS–485 interface. To change the default configuration from RS–232 to an RS–422, or RS–485 interface, refer to Table 5–4 for jumper settings.

RS-422

RS-422 is a point to point, full duplex system requiring 2 wire pairs. Distances of up to 4000 feet between each node is allowed. The receiving device must be terminated. COM3 and COM4 an be unterminated or terminated with a 100 Ω termination resistor.

Figure 5-4 shows a typical RS–422 connection.

RS-485

RS-485 is a multipoint, half duplex system requiring 1 wire pair. Up to 32 nodes can be on the same bus. Distances of up to 4000 feet between the first and final node is allowed. All nodes must be connected to the bus with a stub as short as possible. A terminating resistor must be connected at each end of the system. Any node located between the end points should not be terminated. COM3 and COM4 configurations can be unterminated or terminated with a 120 Ω termination resistor.

An application may implement a node as either the "host" node or as a "remote" node in an RS–485 network. There can be as many as 32 nodes without any bus repeaters in the network. A "host" is referred to as the node that initiates communication; while a "remote" is referred to as a node that is addressed by the host.

In any given communication sequence in an RS–485 network, there can only be one host. The host is responsible for initiating communication, maintaining network registration, and providing housekeeping tasks with other nodes. Remotes cannot initiate a communication. They can only respond to messages that are addressed to them from the host.

Figure 5–3 shows a typical RS–485 connection.

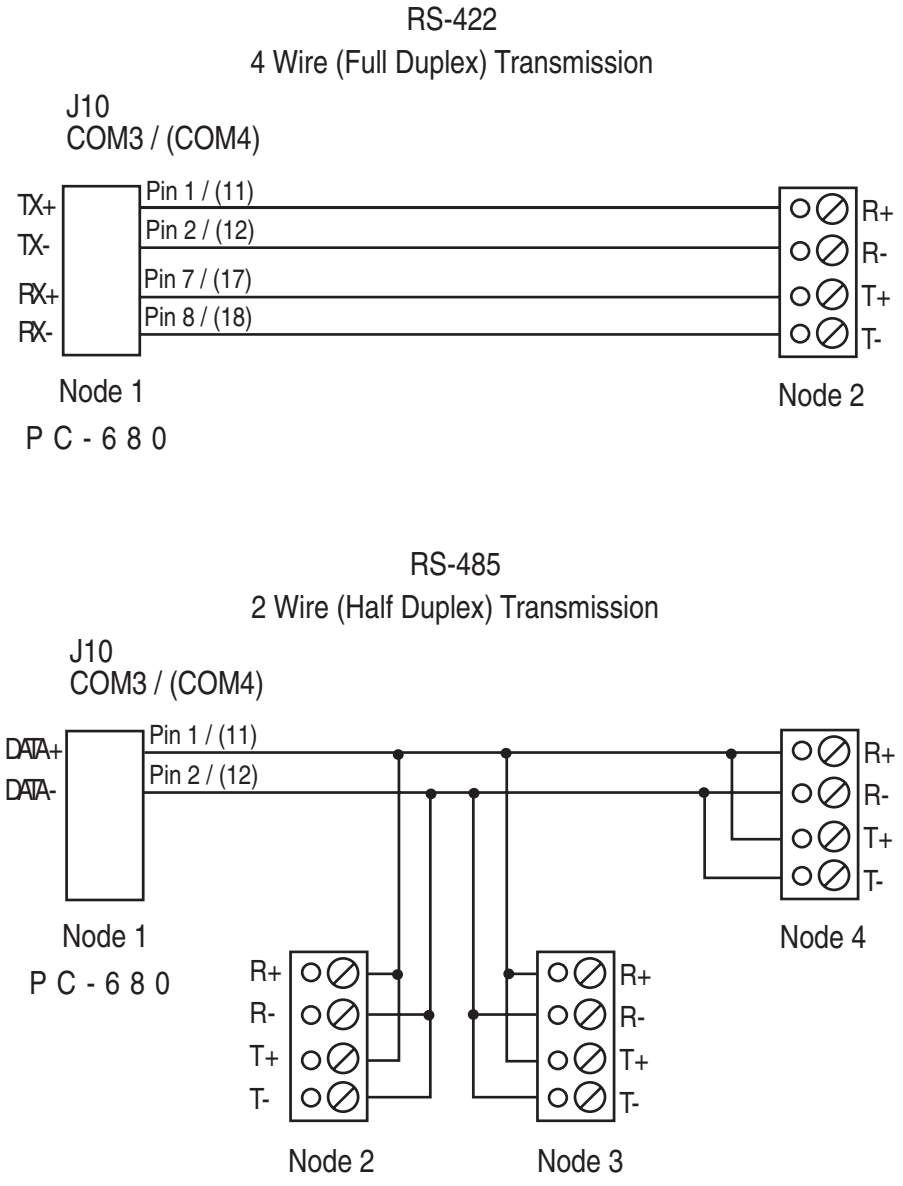
Transmitter Control

The transmitter for the RS-422 and RS-485 interfaces is controlled by the COM3 or COM4 RTS signal. To turn the transmitter ON and OFF through software control, toggle bit 1 of COM3 or COM4 base address + 4. Refer to table 5–8 for transmitter control.

Table 5–8 COM3, COM4 transmitter control

Port	Base Address	RTS Address	Bit 1
COM3	3E8h	3E8h+ 4	1 = transmitter ON 0 = transmitter OFF
COM4	2E8h	2E8h + 4	1 = transmitter ON 0 = transmitter OFF

Figure 5–3 RS-422 and RS-485 hookup diagrams



Chapter 6: LPT1 parallel port

≡ LPT1 parallel port

The LPT1 port has a 26–pin connector. It supports the unidirectional standard mode, bidirectional mode, enhanced parallel port (EPP) mode, and extended capabilities port (ECP) mode.

The LPT1 port supports a number of devices including a PC compatible printer, a multiline display, or a matrix keypad.

Table 6–1 LPT port

LPT1 port addresses	IRQ	Connector
278h	IRQ5	J16
378h *	IRQ7 *	
3BCh		

* = default

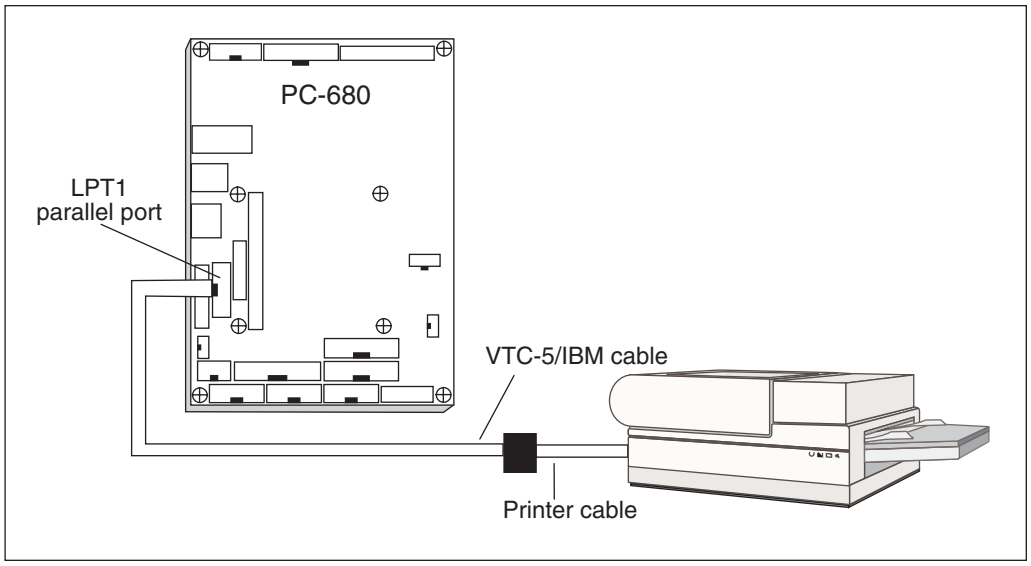
≡ Printer

Note See *Appendix A - Connectors* for mating information.

Installing a printer

1. Make sure that the LPT1 port is in standard or bidirectional mode. This is accomplished in BIOS setup.
2. Connect an Octagon VTC–5/IBM cable (p/n 1237) from the LPT1 port (J16) to the DB-25 connector of your printer cable. Or use an Octagon PCA-36 cable (p/n 4808) and connect directly to a Centronics type printer interface.

Figure 6–1 LPT1 as a printer port



≡ Display

The LPT1 port supports either a 4 x 20 or a 4 x 40 liquid crystal display (LCD). To interface the displays to the PC–680, use the Octagon 2010 interface board. A CMA–26 cable is required to connect the interface board to the PC–680. The program DISPLAY.EXE (found on the PC–680 utility disk) provides an easy method to use the display. Refer also to the *2010 product sheet* for more information on the interface board.

Installing a display

1. Connect a CMA–26 cable from the LPT1 port on the PC–680 (J16) to J1 on the 2010. See Figure 6–2.
2. Connect the display cable to either the 14–pin or 16–pin header on the 2010. The size of the display will determine which header to use.
3. Refer to the file DISPLAY.DOC for more information on initializing and using the display.

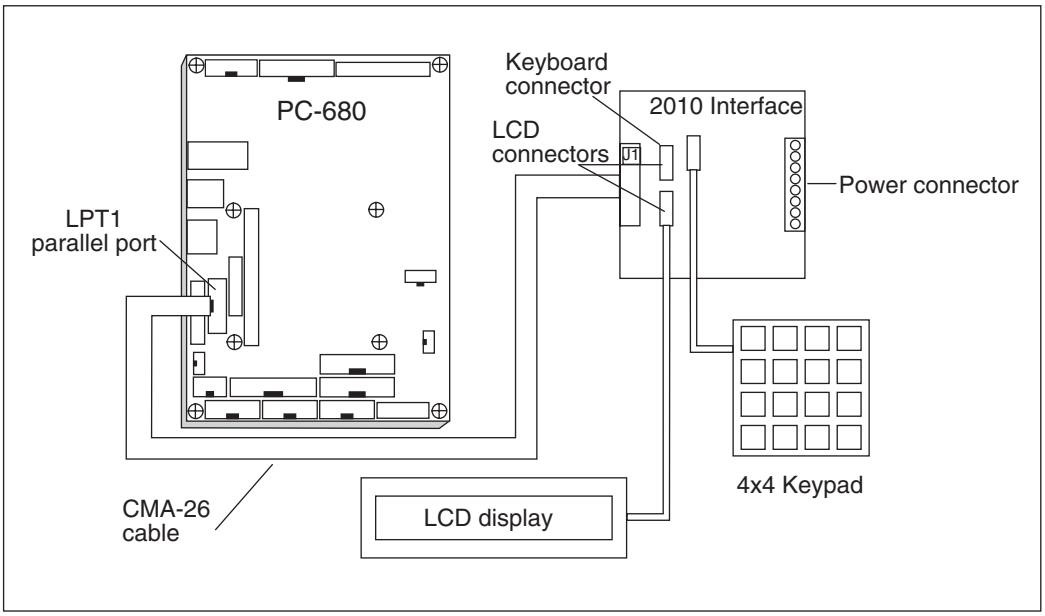
≡ Keypad

LPT1 also supports 4 x 4 matrix keypads. To interface the keypad to the PC–680, use the Octagon 2010 interface board. A CMA–26 cable is required to connect the interface board to the PC–680. The program DISPLAY.EXE (found on the PC–680 utility disk) provides an easy method to use the keypad. Refer to the file DISPLAY.DOC on the PC–680 utility disk for information on initializing and using the keypad. Also, refer to the *2010 product sheet* for information on the interface board.

Installing a keypad

1. Connect a CMA–26 cable from the LPT1 port on the PC–680 (J16) to J1 on the 2010. See Figure 6–2.
2. Connect the keypad cable to the 10–pin header on the 2010.
3. Refer to the DISPLAY.DOC file for more information on reading the keypad.

Figure 6–2 LPT1 as a display and/or keypad port



Chapter 7: Console devices

≡ Description

The PC–680 has three options for console devices. You can use the on–board video with a monitor and a keyboard as your console. You can also use COM1 as the console or you can run the system without a console device.

≡ Selecting console devices

The following represent the PC–680's three options for console devices:

- XVGA and a local keyboard. The XVGA supports CRT, LCD, and EL displays.
- Serial console from COM1. A serial cable/null modem adapter plugged into a host PC running a terminal emulator provides both input and output. The local keyboard also allows input but is not required for operation.
- No console device means no video output, either from the XVGA monitor or the serial console. The local keyboard allows input.

XVGA

For correct usage of the CRT and flat panel, see the *CRTs and flat panels* chapter.

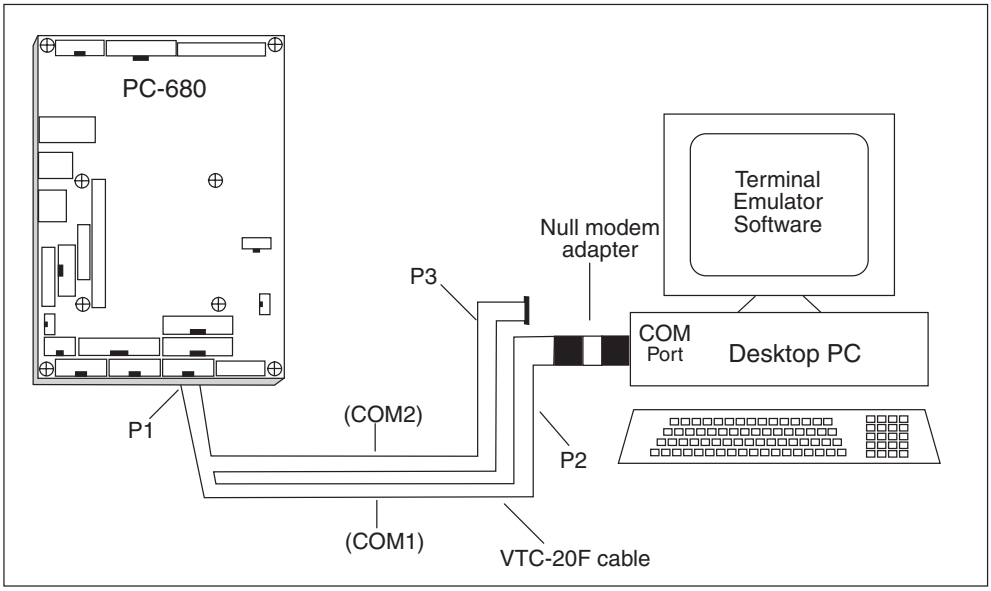
Serial console

COM1 can serve as a console device, allowing you to use your desktop PC to communicate with the PC-680. Refer to Figure 7-1 to connect a desktop computer to the PC-680 as a console device. This connection requires a VTC–20F cable (p/n 4866) and a null modem adapter (p/n 3186). It also requires a terminal emulator program such as Windows HyperLink, ProComm, or an equivalent program.

Follow these steps to use the serial console:

1. Power off the PC–680.
2. Connect a VTC–20F to J7 (COM1/2 port) of the PC–680. Refer to Figure 7–1.
3. Connect P2 (COM1 side of the VTC–20F cable) to the 9–pin null modem adapter. Refer to Figure 7–2.

Figure 7–1 The PC–680 and a serial console



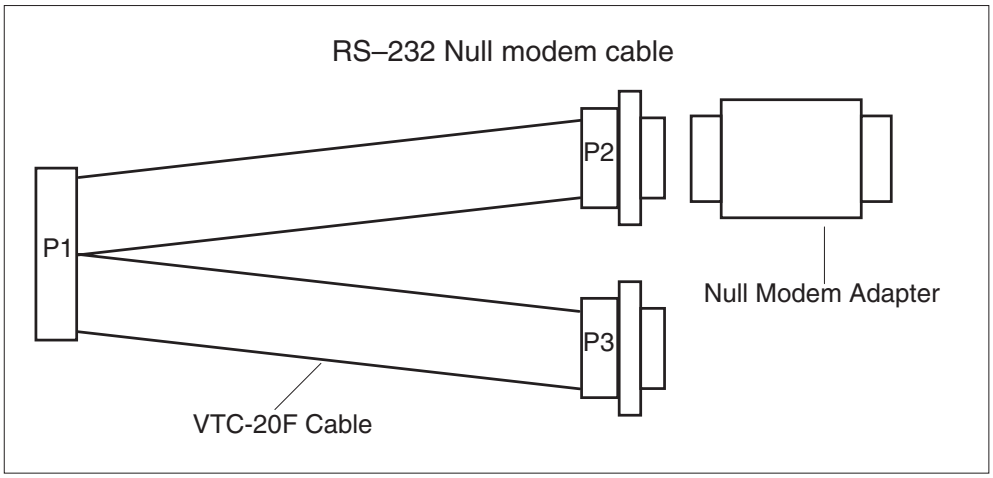
4. Connect the 9–pin null modem adapter to a 9–pin serial port on your PC.
5. Start the terminal emulator program. The emulator program needs the communication settings to be:

   38400 bps, 8 data bits, 1 stop bit, no parity, no flow control, ANSI emulation, and to communicate out of the serial port selected in step 4.

6. Remove W26[3–4] to disable the video BIOS.
7. Power on the PC–680.

   The desktop PC will now act as the keyboard input and monitor output of the PC-680. The PC-680 boot screen should be displayed on the desktop PC monitor. Issuing a DIR command will display the files on the PC-680 C: drive.

Figure 7–2 VTC–20F cable and null modem adapter



≡ Transferring files between the PC–680 and your PC

Once you have established communications between your PC and the PC–680, you can serially download files to any read/write drive used by the PC–680. You can also upload files from the PC–680 to your desktop PC for editing and debugging.

There are two methods to download files through the serial port to the PC–680:

1. The TRANSFER utility is used to download files, one at a time over a serial port, to the PC–680 using the XMODEM protocol. Select XMODEM in your terminal emulator when sending or receiving files. (See the note below on XMODEM).

2. REMDISK/REMSERV utilities allow access to all of the files on a remote disk drive. Once these programs are executed, single or multiple files can then be transferred to and from the PC–680 over a serial port using DOS COPY or XCOPY commands.

   TRANSFER.EXE, REMDISK.EXE and REMSERV.EXE are located on the PC–680 BIOS drive in the DOS directory, and on the PC–680 utility disk in the \DOS directory. Refer to the *Software utilities* appendix for more information on these programs.

Note XMODEM only transfers files in which the file size is exactly on a 128 byte boundary. If the file size does not fall exactly on the boundary, XMODEM automatically rounds the file size up to the next 128 byte boundary with padding characters. For example, a file with a size of 10,000 bytes, will be rounded up to 10,112 bytes, transferred, and written with the new file size. In most cases, this is not a concern, but in some instances the XMODEM padding causes problems. The pad-

ding problems become apparent when an application program is expecting a specific file size or is expecting characters other than the padding characters to be at the end of the file.

≡ Transferring files to the PC–680

In order to transfer files from your PC to a PC–680 drive using the TRANSFER program, you must do one of the following:

Execute the TRANSFER program from both the PC–680 and from your PC.

or

Execute the TRANSFER program from the PC-680, then initiate a send file command from your terminal emulator.

The following steps only detail the procedure for transferring files using TRANSFER on both systems. Refer to TRANSFER.EXE in the *Software utilities* appendix for more information.

1. Refer to the *Serial console* section in this chapter for establishing a serial console connection between the PC-680 and your desktop PC.
2. Execute the TRANSFER program from the PC–680 to receive a file from your PC.

   `PC680 C:\> TRANSFER /COMx /R /V <drive>filename.ext`

   COM*x* specifies the serial port to use where *x* represents a value from 1-4. The default is 1.

   /R specifies to receive a file (default).

   /V enables the display of "R" when a block is received, or "T" when a block is transmitted. Do not use /V when COM1 is the console device.

   `<drive>` is the drive on the PC–680 where the file will be transferred to.

   `filename.ext` is the name of the file on the PC–680 which you are receiving from your PC.
3. Execute the TRANSFER program from your PC to send a file to the PC-680. TRANSFER.EXE must reside on the host system and you must run TRANSFER from DOS or a DOS shell.

Note If using a DOS shell, the idle sensitivity property for the DOS shell must be set to minimum.

`C:\> TRANSFER /COMx /S /V <drive>filename.ext`

COM*x* specifies the serial port to use where *x* represents a

value from 1-4. The default is 1.

/S specifies to send a file.

/V enables the display of "R" when a block is received, or "T" when a block is transmitted. Do not use /V when COM1 is the console device.

`<drive>` is the drive on the desktop PC where the file will be transferred from.

`filename.ext` is the name of the file on the PC–680 which you are receiving from your PC.

Note TRANSFER will time-out if the sending program has not been started after approximately 40 seconds. It displays the following message:

```
Failed to receive <drive>filename.ext
Deleting  <drive>filename.ext
```

Also, you may speed up the transfer using the /Bnnnn switch to increase the baud rate. Example: /B57600. When using the serial console, do not use the /B option on the PC–680. Instead, change the serial console baud rate in BIOS setup.

≡ Transferring files from the PC–680

In order to transfer files from the PC–680 to your PC drive, you must do one of the following:

Execute the TRANSFER program from both the PC–680 and from your PC.

or

Execute the TRANSFER program from the PC-680, then initiate a receive file command from your terminal emulator.

The following steps only detail the procedure for transferring files using TRANSFER on both systems. Refer to TRANSFER.EXE in the *Software utilities* appendix for more information.

1. Refer to the *Serial console* section in this chapter for establishing a serial console connection between the PC-680 and your desktop PC.
2. Execute the TRANSFER program from the PC–680 to send a file from your PC.

   PC680 C:\> **TRANSFER /COM*x* /S /V <drive>*filename.ext***

   COM*x* specifies the serial port to use where *x* represents a value from 1-4. The default is 1.

/S specifies to send a file (default).

/V enables the display of "R" when a block is received, or "T" when a block is transmitted. Do not use /V when COM1 is the console device.

<drive> is the drive on the PC–680 where the file will be transferred from.

filename.ext is the name of the file on the PC–680 which you are sending to your PC.

3. Execute the TRANSFER program from your PC to receive a file from the PC-680. TRANSFER.EXE must reside on the host system and you must run TRANSFER from DOS or a DOS shell.

```
C:\>  TRANSFER /COMx /R /V <drive>filename.ext
```

COM*x* specifies the serial port to use where *x* represents a value from 1-4. The default is 1.

/R specifies to receive a file. This is the default.

/V enables the display of "R" when a block is received, or "T" when a block is transmitted. Do not use /V when COM1 is the console device.

<drive> is the drive on the desktop PC where the file will be transferred to.

filename.ext is the name of the file on the PC which you are sending from the PC-680.

Note TRANSFER will time-out if the sending program has not been started after approximately 40 seconds. It displays the following message:

```
Failed to receive <drive>filename.ext
Deleting  <drive>filename.ext
```

Also, you may speed up the transfer using the /Bnnnn switch to increase the baud rate. Example: /B57600.

≡ Example of downloading a file to the PC–680

The following information on downloading files between the PC–680 and your PC uses the example program DEMO.EXE. This file is on the PC–680 utility disk.

Hardware and software requirements:

- Desktop PC, running a terminal emulator, connected by a VTC-20F cable and a null modem adapter to COM1 of the PC–680.

The following steps only detail the procedure for transferring files using TRANSFER on both systems. Refer to TRANSFER.EXE in the *Software utilities* appendix for more information.

1. Refer to the *Serial console* section in this chapter for establishing a serial console connection between the PC-680 and your desktop PC.
2. Execute the TRANSFER program from the PC–680 to receive a file from your PC.

   ```
   PC680 C:\> TRANSFER DEMO.EXE
   ```

   COM1 is the default serial port, receive is the default function, C:\ is the default drive, DEMO.EXE is the file name to be received.

The following message is displayed from the PC–680:

```
Receiving DEMO.EXE . . .
```

3. Execute the TRANSFER program from your PC to send a file to the PC-680:

   Shell out to DOS from your terminal emulator program. TRANSFER.EXE must reside on the host system.

   ```
   C:\>  TRANSFER /S DEMO.EXE
   ```

   COM1 is the default serial port, send is the selected function, C:\ is the default drive, DEMO.EXE is the file name to be sent and resides in the root directory of C:.

Note TRANSFER.EXE will time-out if the sending program has not been started after approximately 40 seconds. If the time-out occurs, the following message from the PC–680 is displayed:

```
Failed to receive DEMO.EXE!
Deleting DEMO.EXE
```

4. When the file transfer is complete, exit the DOS shell back into the terminal emulator.
5. Type the following DOS command to view the drive directory to confirm that your file has been transferred to the PC–680:

   ```
   PC680 C:\> DIR
   ```

   The system will display the contents of PC-680 drive and will list the DEMO.EXE file.

   ```
   Volume in drive is <label>
   Directory of <drive>:\

   DEMO  EXE   27264 01-07-00   2:57p
   ```

6. To execute the program you have just downloaded type:

   ```
   PC680 C:\> DEMO
   ```

   The DEMO program displays a message on your PC.

≡ Remote disks

Downloading files to the PC–680 using REMDISK/REMSERV

The following uses REMDISK/REMSERV with the PC–680.

Note REMDISK.EXE, and REMSERV.EXE are DOS utilities and require special considerations when executed in a Windows environment. The Datalight web site, **www.datalight.custhelp** has information to sucessfully implement REMDISK/REMSERV while in Windows.

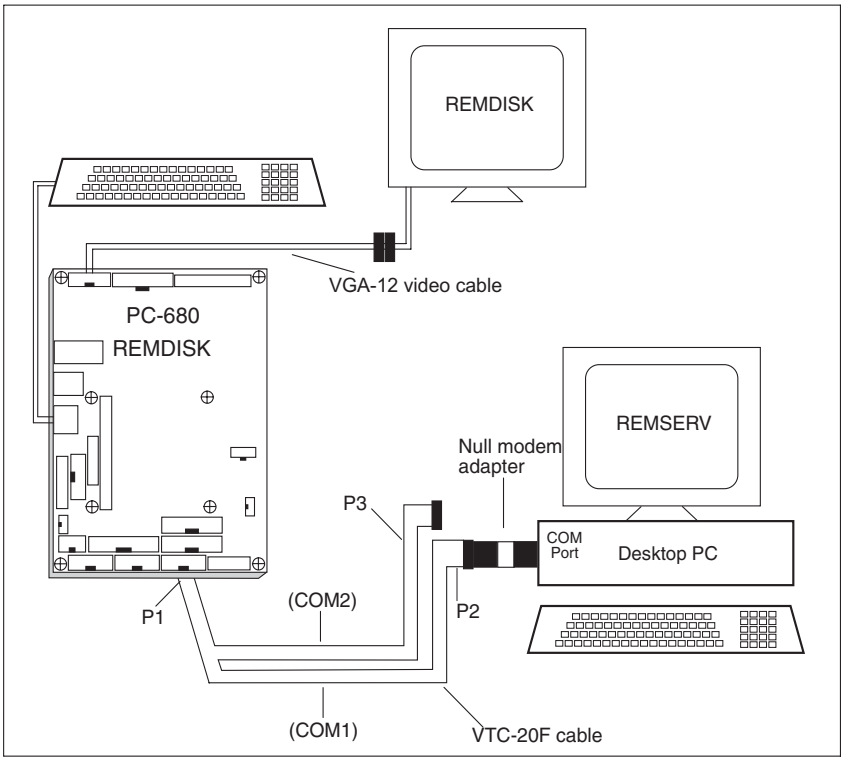
Refer to the *Software utilities* appendix for more information on using REMDISK.EXE and REMSERV.EXE

Hardware and software requirements:

- A Desktop PC, using COM1 to communicated to the PC-680, and running REMSERV.
- A PC–680 system with a keyboard, VGA monitor, VTC-20F cable and null modem adapter, running REMDISK from COM1.

1. Connect the equipment and load the appropriate software on each system as per the following diagram:

Figure 7–3 Downloading files to the PC–680 using REMDISK/REMSERV



2. On the PC–680 system, execute REMDISK.EXE by entering:

```
PC680 C:\> REMDISK
```

The following similar message is displayed on the PC–680 monitor:

```
Remote Disk v1.0
Copyright (c) 1990-1994 Datalight, Inc.
All rights reserved.
Installed as Drive F:  /COM1  /B115+  /T3
```

Note REMDISK assigns the remote drive as the last drive in the system. In this case, drive F: was assigned.

3. Execute REMSERV.EXE on the desktop PC:

```
C:\> REMSERV C:
```

The following message is displayed on the PC:

```
REMSERV v1.0
Copyright (c) 1990-1994 Datalight, Inc.
All rights reserved.
Using COM1 at 115K+ baud. Accessing Drive C:
Time-out is 2 seconds
Press <Esc> to Exit.(There may be a delay before exit oc-
curs)
```

4. Files are transferred to the PC–680 read/write drives by using the DOS COPY and XCOPY commands. From the PC–680 system, enter:

```
PC680 C:\> COPY F:\PC680\DEMO.EXE
PC680 C:\> DIR
PC680 C:\> DEMO.EXE
```

Where F: is actually the C: drive on the host PC, and the DEMO.EXE file resides in the \PC680 directory on the host C: drive of the host PC.

The DEMO program displays a message on the PC–680 monitor.

5. When finished, on the PC–680 system, execute:

```
PC680 C:\> REMDISK /U
```

This unloads REMDISK from the desktop PC.

6. On the desktop PC, press <ESC> to exit REMSERV.

Chapter 8: SSDs, DRAM, and battery backup

≡ Description

The PC–680 supports two solid–state disks and an OEM option for a third disk. SSD0 is a socket for an SRAM, flash, M–Systems DOC, or EPROM device. SSD1 is a 4 MB flash soldered on–board (8 MB OEM option). SSD2 is available as an 8MB OEM option.

≡ SSD0

SSD0 can be populated with a 128K or 512K SRAM, a 512K flash, M–Systems DOC, or a 512K EPROM. The jumpers at W20 and W21 must be set to match the type of device installed (see Table 8–1).

WARNING!

Alignment of an SRAM, flash, DOC, or EPROM device into SSD0 is critical. Mis-alignment may destroy the device and possibly damage the PC-680. Be certain to properly align pin 1 of either the SRAM, flash, or EPROM device with pin 1 of SSD0.

Table 8–1 SSD0 device selection jumpers: W20, W21

Function	Reference Designator	Setting	Description
SSD0 Device Type	W20	2-4	All others (see W21)
		3-4	SRAM *
SSD0 Device Type	W21	1-2, 5-7, 9-10	FLASH
		5-7	M–Systems DOC
		1-2, 4-6, 8-10	SRAM *
		1-3, 2-4, 9-10	EPROM

* = default

The SETSSD.EXE command is used to notify the BIOS that a new drive has been installed, sets the boot order for the drives, and assigns a drive letter to the drives. See the *Managing SSDs* section in this chapter.

Flash and SRAM devices must be formatted using the FXFMT.EXE command. After the devices are formatted, reset the system. You are now ready to copy files to the device in SSD0.

For further information on installing, formating and programming SSD0 devices refer to the *Managing SSDs* section.

≡ Battery backup for SSD0 SRAM and real time calendar clock

If SRAM is used in SSD0, a 3.6V AT battery (p/n 3186) is required for battery backup of the SRAM files. This battery also backs up the CMOS real time clock. The PC–680 does not have a battery installed when it is shipped. To install the battery:

1. Power off the PC–680.
2. Install the 3.6V AT clock battery at the J13 connector. Refer to the component diagram in the *Quick start* chapter for the location of J13.

Table 8–2 Battery connector: J13

Pin	Function
1	Battery
2	Key
3	Gnd
4	Gnd

Note SRAM contents can be affected by system noise. Therefore, the use of SRAM is not recommended in electrically noisy environments, especially when systems are critical.

≡ SSD1

SSD1 is a 4MB flash (8MB OEM) soldered on–board. It contains the BIOS and ROM–DOS 6.22, and is intended for storing application programs to be executed on powerup. It is the default boot drive.

SSD1 can be accessed directly as a read/write DOS drive. While this is convenient for product development, the flash has a limited number of writes allowed. Therefore, Octagon does not recommend SSD1 be used as a data logging device.

≡ Managing SSDs

Flash file system

By default the flash file extended BIOS is loaded at system boot. A message similar to the following is displayed on your screen as the system boots each flash file drive found:

```
FlashFX 4.01.153 (386 DOS)
Copyright © 1993-1998, Datalight Inc.
```

The flash file extended BIOS allows the PC–680 to boot from the flash file system on–board the PC–680. These drives are "simulated" hard drives that look like a standard hard drive on a PC. In some instances it will be necessary to disable the flash file extended BIOS. This is done by removing the "X" W7[3-4] jumper.

Note When installing Windows NT operating system, it is necessary to disable the flash file system.

The flash file system includes an extended BIOS (FLASHFX.IMG), a device driver (FLASHFX.SYS), a format utility (FXFMT.EXE), and a test utility (TESTOEM.EXE).

Use the device driver FLASHFX.SYS to access SSDs when booting from a floppy or hard drive, when the extended BIOS (FLASHFX.IMG) is disabled.

≡ Defining SSDs using SETSSD

SETSSD

SETSSD.EXE allows the user to set or change the SSD drive order, and therefore the boot device as well. Solid state drives are "simulated" hard drives. They can exist before or after any IDE drives and can appear in any order. By setting the order, the SSDs may be accessed as C:, D:, etc. Drive designators will change depending on the SETSSD settings.

The following examples demonstrate how to define SSD drive order:

- To set SSD0 first and SSD1 second, enter the following command:

```
PC-680 C:\> SETSSD SSD0 SSD1
```

In this example, SSD0 is C: and SSD1 is D:.

- To set SSD1 first and SSD0 second, enter the following command:

```
PC-680 C:\> SETSSD SSD1 SSD0
```

In this example, SSD1 is C: and SSD0 is D:.

- To use only SSD1, enter the following command:

```
PC-680 C:\> SETSSD SSD1
```

In this example, SSD1 is C: and SSD0 will not be available.

If there are other hard drives on the system, add the **/before** option to place the order of the SSDs before the hard drives, or add the **/after** option to place the SSDs after the hard drives. For example,

- To set SSD0 as C:, SSD1 as D:, and an IDE drive as E:, enter the following command:

```
PC-680 C:\> SETSSD SSD0 SSD1 /before
```

- To set the IDE drive as C:, SSD1 as D:, and SSD0 as E:, enter the following command:

```
PC-680 C:\> SETSSD SSD1 SSD0 /after
```

Reset the PC-680 after running SETSSD for the new parameters to take effect.

Note The SETSSD parameters may be overridden by removing the "S" W7[9-10] jumper and resetting the system.

Other drive letter designations may be added by device drivers (such as VDISK.SYS), which are in the CONFIG.SYS file on the boot drive.

The boot drive is based upon the drive order set by the SETSSD command and by the BIOS setup "boot sequence" option. If the boot sequence is set to Removable, then Fixed Drives, the system will look for a floppy diskette in drive A:. If a diskette is not installed, or a floppy is not defined, the boot drive will be the first drive specified in the SETSSD command.

≡ Using FXFMT to format an SSD

Formatting SSD1

This section describes how to format SSD1.

> **Reformatting SSD1 requires the use of a floppy or a hard disk to restore system files.**

1. Define the SSD order with the SETSSD command. Since the command input varies depending upon the parameters you need to enter, see the SETSSD command in the *Software utilities* appendix.
2. To begin formatting SSD1, execute FXFMT as follows:

   ```
   PC-680 C:\> FXFMT 8n
   ```

   where *n* is the hard drive sequence number. This number includes IDE drives and SSDs.

   For example, if you have 0 IDE drives and SETSSD shows:

   ```
   [HDDs] SSD0 SSD1
   ```

   then enter the following to format SSD0:

   ```
   PC-680 C:\> FXFMT 80
   ```

   On the other hand, if you have 1 IDE drive, enter:

   ```
   PC-680 C:\> FXFMT 81
   ```

Note If the drive had not been formatted previously, reset the system before accessing the drive. This allows DOS to recognize the drive and add a letter designation to it.

Note FXFMT.EXE must be downloaded from the PC–680 utility disk. This file is located in the \UTILS directory.

Note FXFMT.EXE will not format IDE/ATA drives.

Note The drive order affects the number entered at the FXFMT command.

≡ Using SYS to make an SSD bootable

Adding operating system startup files (using SYS)

To add the system files, issue the following operating systems command:

```
C:\> SYS d:
```

where *d:* specifies the drive letter.

For example, if your system has 1 IDE drive, and SETSSD shows "[HDDs] SSD0 SSD1," then SSD1 should be drive E:. To SYS this drive, use the "SYS *d:*" command.

Note SYS.COM must be downloaded from the PC–680 utility disk. This file is located in the \DOS directory.

Note If you are adding the MS–DOS operating system to SSD1, you must first boot from an MS–DOS bootable device (floppy or hard drive).

Note If you are not booting from ROM–DOS, and wish to SYS ROM–DOS back to the drive, the SYS command requires you to issue the following ROM–DOS commands: COMMAND.COM, ROM–DOS.SYS and SYS.COM.

≡ Using SETSSD and TESTOEM to test an SSD

SETSSD, when used with no parameters, is used to determine the order of the SSDs. TESTOEM is an SSD test used to excercise the SSD by writing and reading data. Refer to the *Software utilities* appendix for more information.

CAUTION

TESTOEM.EXE will destroy all drive data on the SSD except the reserved BIOS area. A boot drive, i.e. floppy, will be required to reformat the SSd.

To test SSD0 and SSD1 perform the following:

1. Run SETSSD.EXE to determine which socket to use with TESTOEM. The socket (either 0 or 1) depends on the order of the SSDs. The first SSD*x* listed is socket 0 (S0) and the second SSD*x* listed is socket 1 (S1). To configure the order of the SSDs, see the *Defining SSDs using SETSSD* section in this chapter.

   For example, running SETSSD with no parameters may give the following output:

   ```
   PC-680 C:\> SETSSD
   [FDDs] SSD1 SSD0 [HDDs]
   ```

   In the above example, SSD1 is the first SSD (S0), and SSD0 is the second SSD (S1).

2. Execute TESTOEM /Sn where n is the socket determined in step 1. For SSD0 in the above example, enter:

   ```
   PC-680 C:\> TESTOEM /S1 /E
   ```

   For SSD1 in the above example, enter:

   ```
   PC-680 C:\> TESTOEM /S0 /E
   ```

≡ Making copies of the PC–680 SSD

GETIMG.EXE is used to capture an image from an existing flash file drive. This is used to program SSD drives onto target systems from a development system. Refer to GETIMG.EXE in the *Software utilities* appendix.

1. To make a copy of the PC–680 to a local file, enter:

   ```
   PC-680 C:\> GETIMG SSD1 <filename>
   ```

2. To make a copy of the PC–680 SSD to a remote file:

   a. Copy GETIMGH.EXE from the PC-680 Utility disk to the C:\ root directory.

   b. Establish serial communications between the PC–680 and the desktop PC using a terminal emulator such as Windows HyperTerminal. Refer to *Console devices, Chapter 7.*

   c. On the PC–680 enter:

      ```
      PC-680 C:\> GETIMG SSD1 <filename>/COM1
      ```

   d. On the desktop PC, exit the terminal emulator, and if running Windows, exit Windows and restart in DOS mode. Enter:

      ```
      C:\> GETIMGH <filename>/COM1
      ```

   e. This will write the SSD image, <*filename*>, to the host drive.

≡ Programming copies of the PC–680 SSD

PGMIMG.EXE is used to program an image from an existing flash file drive to other SSDs on target systems. It can be run locally from a PC-680 to program an on-board SSD, or it can be run remotely from a host PC to program an SSD on a target system. Refer to PGMIMG.EXE in the *Software utilities* appendix.

1. Run GETIMG.EXE to make a copy of the PC–680 SSD to a local file or GETIMGH.EXE to make a copy of the PC–680 SSD to a remote file. Refer to the above section, *Making copies of the PC–680 SSD.*

2. To program a disk image of a local file onto SSD1, enter:

   PC-680 C:\> **PGMIMGH SSD1 <*filename*>**

3. To program a copy of the PC–680 image to a target system SSD1 from a host system:

   a. Copy PGMIMGH.EXE from the PC-680 Utility disk to the C:\ root directory.

   b. Establish serial communications between the PC–680 and the desktop PC using a terminal emulator such as Windows HyperTerminal. Refer to *Console Devices, Chapter 7.*

   c. On the PC–680 enter:

      PC-680 C:\> **PGMIMGH SSD1 <*filename*>/COM1**

   d. On the desktop PC, exit the terminal emulator, and if running Windows, exit Windows and restart in DOS mode. Enter:

      C:\> **PGMIMGH SSD1 <*filename*>/COM1**

   e. This will write the image, <*filename*>, to the PC-680 target system SSD drive.

≡ Programming a new BIOS into SSD1

To program a new BIOS into SSD1, issue one of the following commands:

PC-680 C:\> **PGMBIOS *filename* SSD1**
or
PC-680 C:\> **PGMBIOS SSD0 SSD1**

Note You may need to use the /P option when issuing the PGMBIOS command if the "B" W7[1-2] jumper, and the "P" W7[7-8] jumpers are set to boot from the SSD being programmed.

≡ DRAM

The PC–680 is shipped with 0 MB of DRAM. The on–card memory socket accepts 144-pin SO-DIMMs up to a capacity of 128 MB. The card supports fast page mode (FPM), extended data out (EDO), or SDRAM types of memory. These can be symmetric or asymmetric configurations. Memory is organized as 16 x 8. Using SO-DIMM modules with different organization may not see the full memory size of the device. You may order SDRAM SO-DIMM memory modules from Octagon Systems. See the following for ordering information:

Description	**Octagon P/N**
32 MB SDRAM SO-DIMM	5565
64 MB SDRAM SO-DIMM	5591

Chapter 9: External drives

≡ Description

The PC–680 is compatible with standard floppy disk drives and IDE or EIDE drives, including ATAPI CD-ROM drives. The PC–680 can boot from the hard drive or the CD-ROM drive.

≡ Floppy disk controller

The PC–680 connects directly to one or two 3.5" or 5.25" floppy drives using a standard floppy cable connected to J11.

Note Drive A: requires a twist in the cable, drive B: does not.

Power requirements

You must supply power to the floppy drive(s) through an external source. Refer to your floppy drive manual for specific instructions.

Installing a floppy disk drive

1. Disconnect power to the PC–680.
2. Connect the floppy cable to the floppy drive(s). Make sure pin 1 on the cable is connected to pin 1 on the drive.
3. Insert the 34 pin connector of the cable to J11 on the PC–680.
4. Connect power to the floppy drive.
5. Power on the PC–680. Press F2 to run BIOS setup and select the number of floppy drives installed. Reboot the system after running BIOS setup.

≡ Hard disk controller

The PC–680 will interface to two 16–bit IDE or EIDE devices via a 44–pin connector at J18.

Power requirements

If a 2.5" hard drive is used, power is supplied through the Octagon #4080 cable. If a 3.5" hard drive or CD-ROM drive is used, external power is required. Refer to your drive manual for specific instructions.

Installing an IDE drive:

1. Disconnect power to the PC–680.
2. Connect one end of the Octagon hard drive adapter cable (p/n 4080) to the hard drive. The #4080 cable is designed for either 2.5" or 3.5" drives. Make sure pin 1 on the cable is connected to pin 1 on the drive.
3. Insert the other end of the IDE cable into J18 on the PC–680. Make sure pin 1 on the cable is connected to pin 1 on the PC–680.

WARNING

When using a 2.5" drive, power is supplied through the cable. Take care to align pin one of the cable to pin 1 of the drive, and to pin 1 of the J18 connector. Reversing or offsetting the IDE cable will cause a +5V to ground short and will destroy the cable, damage the drive, and may damage the PC–680.

4. If using a 3.5" drive, connect external power to the drive.
5. Power on the PC–680. Press F2 to run BIOS setup and select the number and type of IDE devices installed. Refer to the *BIOS* setup *programs* chapter for more information on the BIOS setup program. Reboot the system after running BIOS setup.
6. Run FDISK to establish partitions on the hard drive. This partitions the hard drive, and assigns a drive letter. By default, it will assign the drive letter which is subsequent to your currently installed drives. When FDISK is finished, reboot the system. Refer to your DOS manual for more information on FDISK.
6. Format the hard drive using the DOS FORMAT command. When the drive is formatted, reboot the system.
7. If you want to boot the system from the hard drive, run the SYS command. The system copies COMMAND.COM as well as hidden files to the hard drive.
8. Run SETSSD with the /before or /after parameters to ensure that all drives are properly recognized, and that the proper boot sequence is loaded into BIOS setup. Reboot the system.

Chapter 10: Digital I/O

≡ Description

The PC–680 has 32 lines of industrial, digital I/O. Each I/O is a terminated, bidirectional line that can be individually configured as an input, input with event edge sensing, input with level sensing, output, or output with readback. Inputs can generate interrupts or can be polled. The lines are 5V compatible and can sink 25mA. The I/O port can also drive Octagon MPB series opto racks (G4 style modules) directly, controlling AC and DC loads to 240V at 3A.

Each line has a 4.7kΩ termination resistor, ESD, and over/under shoot protection.

Interrupts can be generated from any of the 32 inputs. These interrupts can be enabled, disabled, and made to interrupt on a rising or falling event/edge.

≡ Major features

- 32 lines of digital I/O
- Diode clamping protection on each I/O line
- Pull–up, pull–down, or float option for each bank of eight lines
- Two 26–pin shrouded connectors

≡ Software

For information on digital I/O software examples, refer to the PC–680 Utility disk (p/n 5459). Software examples are in C, CAMBASIC, and QuickBasic.

Table 10–1 Digital I/O port

Digital I/O port address	IRQ	Connector
100h, 120h *	IRQ15 *	J6 - I/O lines 0 - 23
		J5 - I/O lines 24 - 32

* = default

≡ Jumpers and connectors

Each bank of eight I/O lines can have either a 4.7K Ω pull–up, a 4.7KΩ pull–down, or floating operation. Termination is selected by jumpers.

Table 10–2 W5: Pull–up and pull–down jumpers

Function	Reference Designator	Setting	Description
GPIO Pull Status	W5	2-4	I/O[0:7] Pull up (+5V)
		4-6	I/O[0:7] Pull down (GND) (Pin 4 nc for I/O[0:7] float)
		1-3	I/O[8:15] Pull up (+5V)
		3-5	I/O[8:15] Pull down (GND) (Pin 3 nc for I/O[8:15] float)
		9-11	I/O[16:23] Pull up (+5V)
		7-9	I/O[16:23] Pull down (GND) (Pin 9 nc for I/O[16:23] float)
		10-12	I/O[24:31] Pull up (+5V)
		8-10	I/O[24:31] Pull down (GND) (Pin 8 nc for I/O[24:31] float)

Note If you select the pull–down option for any eight lines, these lines become **inputs** only. These lines will not work as outputs.

Table 10–3 J6: Digital I/O [0:7], [8:15], [16:23], J5: Digital I/O [24:31]

	J6 Digital I/O					J5 Digital I/O	
Pin	**Function**	**Pin**	**Function**	**Pin**	**Function**	**Pin**	**Function**
	Port 0		**Port 1**		**Port 2**		**Port 3**
19	bit 0	10	bit 0	13	bit 0	19	bit 0
21	bit 1	8	bit 1	16	bit 1	21	bit 1
23	bit 2	4	bit 2	15	bit 2	23	bit 2
25	bit 3	6	bit 3	17	bit 3	25	bit 3
24	bit 4	1	bit 4	14	bit 4	24	bit 4
22	bit 5	3	bit 5	11	bit 5	22	bit 5
20	bit 6	5	bit 6	12	bit 6	20	bit 6
18	bit 7	7	bit 7	9	bit 7	18	bit 7
2	+5VDC Safe					2	+5VDC Safe
26	Gnd					26	Gnd

≡ Programmable registers

The PC–680 supports standard, enhanced, and Octagon operating modes. Each mode has a different set of registers. Enhanced and Octagon operating modes use the same registers. However, in addition to its standard set of registers, the Octagon mode has an extra set of registers.

≡ Standard operating mode

Standard operation provides access to the four I/O ports and is selected after a power cycle or reset.

Table 10–4 Standard I/O port addressing

Address offset	Register	Read operation	Write operation
000h	Port 0 data	MOD00–MOD07	MOD00–MOD07
001h	Port 1 data	MOD08–MOD15	MOD08–MOD15
002h	Port 2 data	MOD16–MOD23	MOD16–MOD23
003h	Port 3 data	MOD24–MOD31	MOD24–MOD31
006h	Event sense	(MOD:0–7, 24–26)	Control
007h	Mask register	Status	Control

I/O port operation

Each of the four I/O ports has eight I/O lines and a corresponding 8–bit data register. Data bit D0 of the port register corresponds to the least significant I/O point in each port.

Table 10–5 I/O point write/read ports (port and I/O point assignments)

Port	D7	D6	D5	D4	D3	D2	D1	D0
0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
2	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
3	Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24

The I/O output becomes active (low) when writing to the specified register with the corresponding data bit set (1). The I/O output becomes inactive (high) when writing to a register with the bit reset (0).

The status of the input pin is returned when reading the specified register. A high bit (1) indicates the presence of a low input. A low

bit (0) indicates a high input is present.

Event sense operation

The event sense register is used to optionally determine input transitions on I/O points—polarity is selected by the mask register. Event status of the eight event inputs (E0–7) and event sense status clearing is done through the event sense register.

Table 10–6 Event sense register

Base Address	**Data**	D7	D6	D5	D4	D3	D2	D1	D0
006h	**Event**	E7	E6	E5	E4	E3	E2	E1	E0

Reading a logical 1 in an event sense register bit indicates an event has occurred on that input.

Writing a logical 0 to an event sense register bit clears its corresponding event sense flip–flop. To re–enable the corresponding event sense input after is it cleared, powered up, or reset, each data bit of the event sense register must be written with a logical 1.

Table 10–7 Event sense inputs

E7	E6	E5	E4	E3	E2	E1	E0	Connector
				I/O3	I/O2	I/O1	I/O0	J6
I/O27	I/O26	I/O25	I/O24					J5

Mask register operation

The mask register prevents writes to the output ports, unless it is enabled. By default, powerup unmasks the register to allow writes to the output ports. For example, writing the mask register bits D0 through D5 with a logical 1, masks I/O ports 0 through 5. Reading the mask register determines which ports are masked or enabled.

The upper two bits in the mask register are used simultaneously with the event sense register. When writing to the mask register, the upper two bits select the polarity sensed by event sense inputs E0 through E7. Bits 7 and 6, respectively, determine E7–4 and E3–0. When a logical 0 (powerup default) is written, negative events or edges are sensed. When a logical 1 is written, positive events are sensed.

The most significant bit (D7) returns the interrupt signal status on the interrupt pin of the PC–680 card when the mask register is read. A logical 1 indicates the interrupt is asserted.

The following table shows the relationships between the data bits and the mask register:

Table 10–8 Mask port

Address offset	D7	D6	D5	D4	D3	D2	D1	D0
7(write)	PE7–4	PE3–0	not used	not used	Port 3	Port 2	Port 1	Port0
7(read)	Int	0	not used	not used	Port 3	Port 2	Port 1	Port0

≡ Enhanced operating mode

The enhanced mode is selected by writing four different bytes to register 7, in consecutive order, without performing any reads or writes to other registers. The data pattern 07h, 0Dh, 06h, 12h must be written immediately after reset.

The board has three register banks in the enhanced mode: Bank 0, Bank 1, and Bank 2. Bits 7 and 6 of register 7 in all three banks determine which bank of registers is selected. See the table below.

Register bank selection

Table 10–9 Register bank selection

Register 7 (all banks) Bit7	Bit6	Bank selected
0	0	Bank 0
0	1	Bank 1
1	0	Bank 2
1	1	Invalid

Bank 0 operations

Digital I/O (I/O0–I/O31), registers 0–3, bank 0 (r/w)

The digital I/O lines 0 through 31 are active low. The four registers in bank 0 assign the least significant I/O line (I/O0) to the least significant data bit (D0) of register 0, and the most significant I/O line (I/O31) to the most significant data bit (D7) of register 3. To change or monitor each line, write or read the individual register bit. On powerup or reset, the registers are automatically reset to logical 0, which forces the outputs to be high if the pull–up option is selected for that particular nibble. Refer to the *I/O point write/read ports* table for more information.

Table 10–10 Digital I/O (I/O0–I/O31), registers 0–3, bank 0 (r/w)

Write to register:	Read from register:
Bit0 – port* D0 control	Bit0 – port* D0 status
Bit1 – port* D1 control	Bit1 – port* D1 status
Bit2 – port* D2 control	Bit2 – port* D2 status
Bit3 – port* D3 control	Bit3 – port* D3 status
Bit4 – port* D4 control	Bit4 – port* D4 status
Bit5 – port* D5 control	Bit5 – port* D5 status
Bit6 – port* D6 control	Bit6 – port* D6 status
Bit7 – port* D7 control	Bit7 – port* D7 status

Mask register: Register 7, bank 0 (r/w)

The Mask Register prevents writing data to the four output ports. On powerup, by default, the register is unmasked, which then allows writes to the output ports. I/O ports 0 through 5 are each masked when the Mask Register bits D0 through 5 are written with logical 1s. A read returns the status of the Mask Register.

Bits 7 and 6 of the Mask Register determine which bank of registers are selected. See the *Register bank selection* Table.

Table 10–11 Mask register

Write to register:	Read from register:
Bit0 – port 0 write mask	Bit0 – port 0 status
Bit1 – port 1 write mask	Bit1 – port 1 status
Bit2 – port 2 write mask	Bit2 – port 2 status
Bit3 – port 3 write mask	Bit3 – port 3 status
Bit4 – port 4 write mask	Bit4 – port 4 status
Bit5 – port 5 write mask	Bit5 – port 5 status
Bit6 – bank select bit 0	Bit6 – bank status bit 0
Bit7 – bank select bit 1	Bit7 – bank status bit 1

The external event sense input polarity bits found in the Mask Register for the standard operating mode have been moved to the Event Control Register 1 (register 7, bank 1) for the Enhanced mode.

External event sense register: Register 6, bank 0 (r/w)

The event sense register returns and selectively clears event sense status.

Table 10–12 Event sense status

Write to register:	Read from register:
Bit0 – clear ext. sense bit E0	Bit0 – ext. sense status bit E0
Bit1 – clear ext. sense bit E1	Bit1 – ext. sense status bit E1
Bit2 – clear ext. sense bit E2	Bit2 – ext. sense status bit E2
Bit3 – clear ext. sense bit E3	Bit3 – ext. sense status bit E3
Bit4 – clear ext. sense bit E4	Bit4 – ext. sense status bit E4
Bit5 – clear ext. sense bit E5	Bit5 – ext. sense status bit E5
Bit6 – clear ext. sense bit E6	Bit6 – ext. sense status bit E6
Bit7 – clear ext. sense bit E7	Bit7 – ext. sense status bit E7

≡ Bank 1 operations

Event sense registers: Registers 0–3, bank 1 (r/w)

Event sense register (I/O0–I/O31) registers 0–3, bank 1 (r/w)

The status of each I/O port sense line is returned after reading the corresponding register (registers 0–3). Reading 0 = no event occurred; reading 1 = event occurred.

Each data bit written with a logical 0 clears its corresponding event sense flip–flop. After the corresponding event sense is cleared, writing a logical 1 re–enables the event sense on the corresponding line.

The event input logic is enabled by using the event sense registers. Before enabling the event input logic, the polarity of the event sense logic must be set using the event control registers (register 6, bank 1 and register 7, bank 1.)

Table 10–13 Example of event sense register

Write to register:	Read from register:
Bit0 – enable/clear port* sense D0	Bit0 – port* sense D0 status
Bit1 – enable/clear port* sense D1	Bit1 – port* sense D1 status
Bit2 – enable/clear port* sense D2	Bit2 – port* sense D2 status
Bit3 – enable/clear port* sense D3	Bit3 – port* sense D3 status
Bit4 – enable/clear port* sense D4	Bit4 – port* sense D4 status
Bit5 – enable/clear port* sense D5	Bit5 – port* sense D5 status
Bit6 – enable/clear port* sense D6	Bit6 – port* sense D6 status
Bit7 – enable/clear port* sense D7	Bit7 – port* sense D7 status

Event control register 0: Register 6, bank 1 (w)

A write to the event control register controls the polarity of the sense event for I/O ports 0 through 3. A logical 0 senses negative events. A logical 1 senses positive events. The event input logic is enabled by using the event sense registers (register 0 – 3, bank 1). Before enabling the event input logic, the polarity of the event sense logic must be set using the event control register.

Table 10–14 Event control register

Write to register:
Bit0 – port 0 (bit0–bit3)
Bit1 – port 0 (bit4–bit7)
Bit2 – port 1 (bit8–bit11)
Bit3 – port 1 (bit12–bit15)
Bit4 – port 2 (bit16–bit19)
Bit5 – port 2 (bit20–bit23)
Bit6 – port 3 (bit24–bit27)
Bit7 – port 3 (bit28–bit31)

Event status register 0: Register 6, bank 1 (r)

Reading from the event status register returns the event sense on I/O ports 0 through 3 and external event sense register (register 6, bank 0). The event status register also returns the status of the interrupt pin.

Note Bit 7, the interrupt status pin, indicates an event sense was detected on one of the four I/O ports or on the external event sense register.

Note Logical 1 means that an interrupt has been declared.

Table 10–15 Event status register 0

Reading from register:
Bit0 – port 0 interrupt status (bit0–bit7)
Bit1 – port 1 interrupt status (bit8–bit15)
Bit2 – port 2 interrupt status (bit16–bit23)
Bit3 – port 3 interrupt status (bit24–bit31)
Bit4 – not used
Bit5 – not used
Bit6 – external sense interrupt status (E0–E7)
Bit7 – interrupt status pin

Event control register 1: Register 7, bank 1 (w)

The event control register controls the external event sense register 6. A logical 0 senses negative events. A logical 1 senses positive events. Bits 6 and 7 select an individual bank. The event input logic is enabled by using the event sense register (registers 0 – 3, bank 1). Before enabling the event input logic, the polarity of the event sense logic must be set using the event control register.

Table 10–16 Event control register 1

Write to register:
Bit0 – not used
Bit1 – not used
Bit2 – not used
Bit3 – not used
Bit4 – external sense inputs (E0–E3)
Bit5 – external sense inputs (E4–E7)
Bit6 – bank select bit 0
Bit7 – bank select bit 1

Bank select status register 1: Register 7, bank 1 (r)

A read from this register returns only the bank you are in.

Table 10–17 Bank select status register

Reading from register:
Bit0 – not used
Bit1 – not used
Bit2 – not used
Bit3 – not used
Bit4 – not used
Bit5 – not used
Bit6 – bank status bit 0
Bit7 – bank status bit 1

≡ Bank 2 operations

Debounce control register: Register 0, bank 2 (r/w)

The debounce control register controls the passage of each individual port or external sense input through debounce logic before they are recognized. A logical 0 disables the debounce logic and a logical 1 enables the debounce logic.

Table 10–18 Debounce control register

Bit	Description
Bit0	– debounce control port 0 (bit0–bit7)
Bit1	– debounce control port 1 (bit8–bit15)
Bit2	– debounce control port 2 (bit16–bit23)
Bit3	– debounce control port 3 (bit24–bit31)
Bit4	– not used
Bit5	– not used
Bit6	– debounce control external sense (E0–E3)
Bit7	– debounce control external sense (E4–E7)

Debounce duration register 0: Register 1, bank 2

Debounce duration register 0: Register 1, bank 2 (r/w)

The debounce duration register 1 controls the duration required by each input signal (for ports 0 through 3 and event sense inputs) before it is recognized. The available debounce times are 4 µs, 64 µs, 1 µs, and 8 ms.

Table 10–19 Debounce duration

Debounce value		Debounce time
Bit 1	**Bit 0**	
0	0	4 µs
0	1	64 µs
1	0	1 ms
1	1	8 ms

This register controls ports 0 through 3. Default values are 00, thus setting a 4 µs debounce period for each port.

Table 10–20 Debounce duration register 0

Bit	Description
Bit0	– port 0 debounce value, bit 0
Bit1	– port 0 debounce value, bit 1
Bit2	– port 1 debounce value, bit 0
Bit3	– port 1 debounce value, bit 1
Bit4	– port 2 debounce value, bit 0
Bit5	– port 2 debounce value, bit 1
Bit6	– port 3 debounce value, bit 0
Bit7	– port 3 debounce value, bit 1

Debounce duration register 1: Register 2, bank 2

Debounce duration register 1: Register 2, bank 2 (r/w)

The debounce duration register 1 controls the duration required by each input signal (for ports 4 and 5 and event sense inputs) before it is recognized. The available debounce times are 4 µs, 64 µs, 1 µs, and 8 ms.

Table 10–21 Debounce duration register 1, port 2, bank 2

Debounce value		Debounce time
Bit 1	**Bit 0**	
0	0	4 µs
0	1	64 µs
1	0	1 ms
1	1	8 ms

The debounce duration register 1 controls ports 4 and 5 and the external sense inputs. The default values are 00, thus setting a 4µs debounce period.

Table 10–22 Debounce duration register 1

Bit	Description
Bit0	– port 4 debounce value, bit 0
Bit1	– port 4 debounce value, bit 1
Bit2	– port 5 debounce value, bit 0
Bit3	– port 5 debounce value, bit 1
Bit4	– external sense 0–3 debounce value, bit 0
Bit5	– external sense 0–3 debounce value, bit 1
Bit6	– external sense 4–7 debounce value, bit 0
Bit7	– external sense 4–7 debounce value, bit 1

Bank select register 2: Register 7, bank 2 (r/w)

A write to this register selects an individual bank. A read from this register returns only the bank you are in.

Table 10–23 Bank select register 2

Write to register:	Read from register:
Bit0 – not used	Bit0 – not used
Bit1 – not used	Bit1 – not used
Bit2 – not used	Bit2 – not used
Bit3 – not used	Bit3 – not used
Bit4 – not used	Bit4 – not used
Bit5 – not used	Bit5 – not used
Bit6 – bank select bit 0	Bit6 – bank select bit 0
Bit7 – bank select bit 1	Bit7 – bank select bit 1

≡ Octagon operating mode

Octagon mode extends the enhanced mode to provide greater control over event sensing and to also provide delta sense capability.

Advanced control register 0 (Address offset: 10h)

The advanced control register enables ports 0 through 5 for Octagon mode operation. The PC–680 must be in the enhanced mode for the Octagon operations to function.

Table 10–24 Advanced control register 0

Bit	Function
Bit7 – RO	Enhanced mode enabled
Bit6 – R/W	Not used
Bit5 – R/W	Not used
Bit4 – R/W	Not used
Bit3 – R/W	Enable port 3, OCT mode
Bit2 – R/W	Enable port 2, OCT mode
Bit1 – R/W	Enable port 1, OCT mode
Bit0 – R/W	Enable port 0, OCT mode

Note 1 = Octagon mode; 0 = Enhanced mode.

Delta sense register (0–5): (Address offset: 12h–17h)

The Delta Sense registers (0–5) are enabled by the Advanced Control register 0. There is a unique Delta Sense register for each port and a unique bit for each line. For example, Delta Sense register 3 is enabled by bit 3 of the Advanced Control register 0. Delta Sense register 3 controls delta sense operation of port 3, bit 7 through 0. The Delta Sense capability detects any transition on the associated I/O line at the bit level. Each line can be independently monitored.

Note Delta Sense operation overrides any polarity sense enable in Standard mode and any polarity sense set in Octagon mode.

Table 10–25 Delta sense registers (0–5)

Bit	Function
Bit7 – R/W	Enable/disable delta sense operation, D7
Bit6 – R/W	Enable/disable delta sense operation, D6
Bit5 – R/W	Enable/disable delta sense operation, D5
Bit4 – R/W	Enable/disable delta sense operation, D4
Bit3 – R/W	Enable/disable delta sense operation, D3
Bit2 – R/W	Enable/disable delta sense operation, D2
Bit1 – R/W	Enable/disable delta sense operation, D1
Bit0 – R/W	Enable/disable delta sense operation, D0

Note 0 = disable delta sense operation
1 = enable delta sense operation, disable sense value operation.

Polarity event extended registers (0–5): (Address offset 10h–1Dh)

The Polarity event extended registers are enabled by the appropriate bit in the Advanced control register 0. There is a unique register for each port and a unique bit for each line. These registers control the polarity sense value of each I/O sense bit in its respective port. This functions the same as Event Control Register 0 (register 1, bank 1) and Event Control Register 1 (register 7, bank 1). However, polarity event extended registers (0–5) provide the capability to set the polarity sense value of individual bits. Whereas, the enhanced mode only allowed this control at the nibble level.

Table 10–26 Polarity event extended registers

Note Octagon mode polarity sense overrides any polarity sense enabled in standard mode

Bit	Function
Bit7 – R/W	Set polarity of sense operation, bit 7
Bit6 – R/W	Set polarity of sense operation, bit 6
Bit5 – R/W	Set polarity of sense operation, bit 5
Bit4 – R/W	Set polarity of sense operation, bit 4
Bit3 – R/W	Set polarity of sense operation, bit 3
Bit2 – R/W	Set polarity of sense operation, bit 2
Bit1 – R/W	Set polarity of sense operation, bit 1
Bit0 – R/W	Set polarity of sense operation, bit 0

Note 1 = rising edge operation
0 = falling edge operation

Chapter 11: CRTs and flat panels

≡ Description

The video system on the PC–680 uses the advanced 69000 video controller from Chips & Technologies. It supports CRT, LCD and EL displays with resolutions to 1024 x 768 x 16 bpp (1280 x 1024 on some selected displays). Displays from CGA through XVGA are supported. The 69000 is also a graphics accelerator with real time PC–video being supported. Since the video circuitry operates on the PCI bus at the full PCI bus speed, programs like Windows execute very rapidly. The video section has 2 MB of video SDRAM for high–resolution displays and simultaneous CRT and flat panel operation. The PC–680 supports 5V flat panel displays.

Standard VGA monitors with analog inputs are connected using a VGA–12 cable (p/n 4865) connected to J12. Flat panel displays are connected using a 50–pin 2mm connector at J4. PC–video connects to the 60–pin connector at J8. Refer to the VGA 69000 utility disk for additional information on flat panel displays.

≡ Video features

Below is a list of standard video features installed on the PC–680:

- High performance Chips & Technologies VGA 69000 video controller
- 2 MB DRAM for display buffering
- CRT support with resolutions to 1024 x 768 x 16 at 75 MHz
- Flat panel support with the following resolutions:
  - — 640 x 480 x 24 bpp
  - — 800 x 600 x 24 bpp
  - — 1024 x 768 x 16 bpp
  - — 1280 x 1024 x 8 bpp on some selected displays
- Support for plasma, EL and LCD displays
  - — 5V flat panel support
  - — Flat panel power sequencing
  - — Software adjustable positive bias voltage supply for passive LCD panels (negative bias voltage supply is optional)
- PC–video interface for full motion video overlay
- PCI bus interface for fast execution

≡ Programming the video BIOS

The PC–680 SSD1 BIOS is factory configured and programmed for a CGA/VGA/SVGA/XVGA CRT monitor and a Sharp LQ10-D421 flat panel display. If you wish to use a different flat panel, you must reprogram the video BIOS with the appropriate flat panel driver. To reprogram your video BIOS, load the appropriate driver from the 69000 utility disk.

Note Refer to the README.DOC file on the 69000 utility disk for a list of the supported flat panel displays. If your particular display is not currently listed, contact Octagon Technical Support (303–426–4521) for assistance.

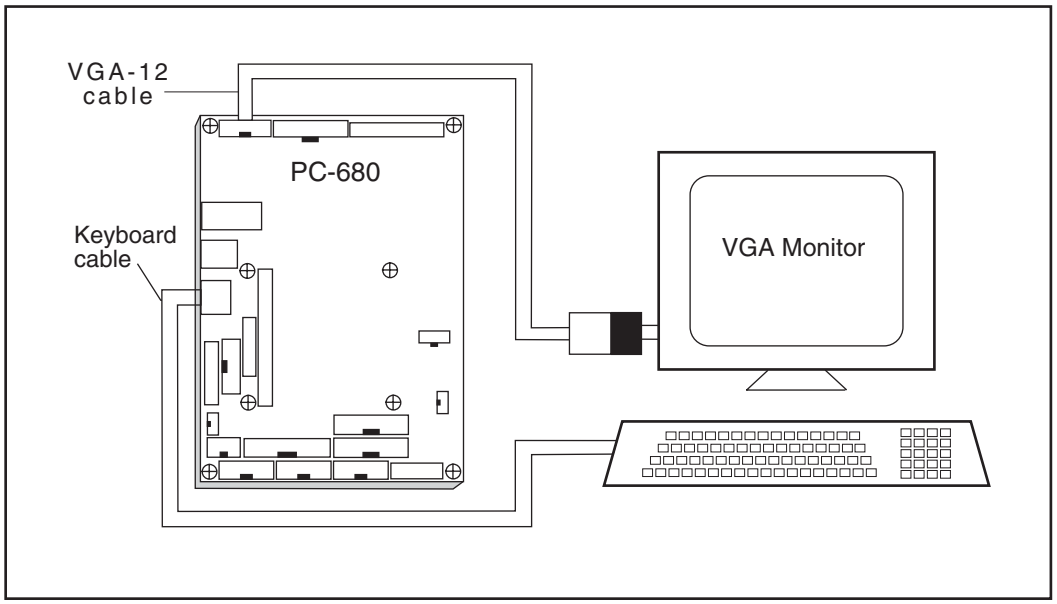
Note The SSD1P BIOS, which is the protected BIOS area, contains a video BIOS for a standard VGA monitor only. Use the "P" jumper to select SSD1 or SSD1P.

To load a new BIOS to support a different flat panel:

1. Attach a CRT monitor, a PS/2 compatible keyboard, and a floppy drive to the PC–680. Refer to Figure 11–1 for the correct cables and locations of the keyboard, VGA monitor, and floppy drive connectors.

Note If a monitor and keyboard are not available, connect the PC–680 to your PC by using a remote serial console. Refer to the *Serial Console* section in the *Console devices* chapter.

Figure 11–1 The PC–680, a VGA monitor, and a PS–2 compatible keyboard



2. Power on the PC–680.
3. Build a BIOS using MAKEBIOS (located in the PC-680 utility disk / extbios directory) with the appropriate video BIOS (located on the 69000 disk). Example:

   ```
   PC680 C:\> MAKEBIOS \69000\DAT\LQ15X015.BIN
   ```

   This creates the file OCTAGON.BIN.
4. Then transfer or copy PGMBIOS.EXE and OCTAGON.BIN to the PC-680. Refer to the *SSDs, DRAM, and battery backup* chapter.
5. On the PC-680, execute PGMBIOS to program SSD1. Example:

   ```
   PC680 C:\> PGMBIOS OCTAGON.BIN SSD1 /p
   ```
6. Confirm that jumper "B", W7[1-2] is on and the "P" jumper, W7[7-8], is on to enable the SSD1 BIOS.
7. Power off the PC–680.
8. If a bias voltage is required for the flat panel, refer to the *Flat panels requiring bias voltage* section in this chapter.
9. Install the flat panel cable into connector J4 and then apply power to the system.

   If you wish to program in another flat panel BIOS, remove the "P" jumper, W7[7-8]. Install a VGA monitor and cable (VGA-12). Power the system back up and reprogram the SSD1 BIOS again.

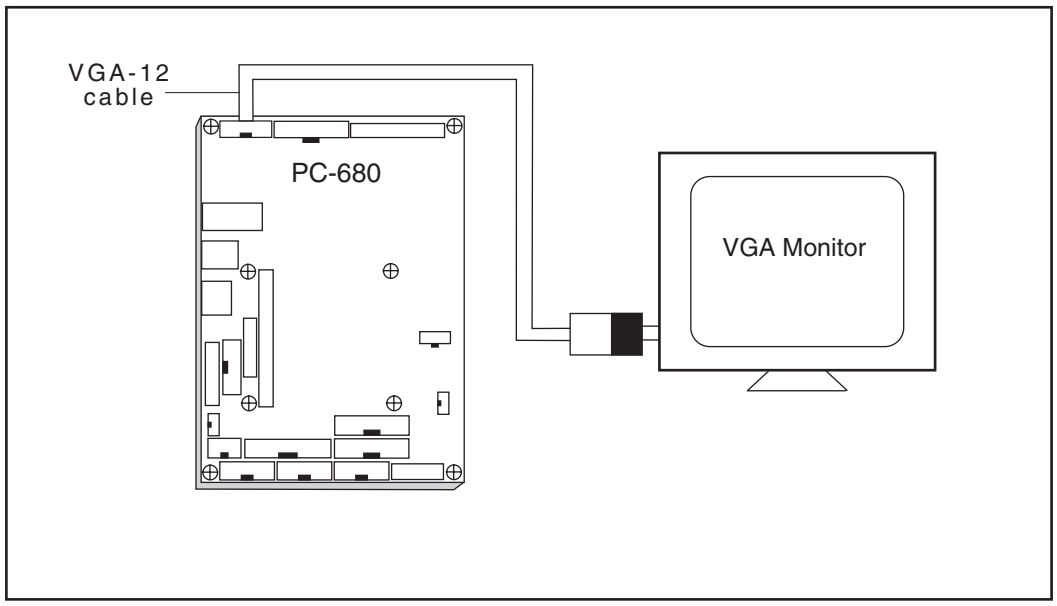
≡ Connecting a monitor

The PC–680 supports both an analog monitor and/or a flat panel display. The CT.COM and FP.COM programs allow you to toggle between the monitor and the flat panel. If the flat panel supports simultaneous mode, the SM.COM program will allow you to display images from both the monitor and the flat panel at the same time. These programs are on the VGA 69000 utility disk in the \UTILS subdirectory along with other diagnostic and configuration utilities. Refer to the README.DOC file.

Analog monitor

1. The 16–pin connector at J12 supports an analog CGA/VGA/SVGA/ XVGA CRT color or monochrome monitor. Refer to Figure 11–2.

Figure 11–2 The PC–680 and a VGA monitor



2. Use a VGA–12 adapter cable with the standard VGA monitor.
3. Plug the VGA–12 adapter cable into J12 on the PC–680.
4. Plug the DB-15 end of the VGA-12 cable into the VGA cable of the monitor.
5. Enable the video BIOS by installing jumper W26[3–4].

≡ Connecting a flat panel display

The PC–680 is factory configured and programmed for a CGA/VGA/ SVGA/XVGA CRT monitor and a Sharp LQ10-D421 flat panel display. If you wish to use a different flat panel, you must reprogram the video BIOS with the appropriate flat panel driver. To reprogram your video BIOS refer to *Programming the video BIOS* in this chapter. Note that only 5V flat panels are supported.

The 69000 utility disk contains text files for each of the supported flat panels. These text files include wiring diagrams specific to individual flat panels. Refer to the specific text file associated with your flat panel to build an interface cable, and to determine the correct settings for the flat panel jumpers.

Flat panels requiring bias voltage

To determine if your flat panel requires bias voltage, refer to the text file on the 69000 utility disk which is specific to your flat panel or refer to your flat panel information.

The factory default configuration for the bias voltage ranges from +21 to +29 VDC. To verify bias voltage, connect a DC voltage meter input lead to J4 pin 3 and a reference lead to J4 pin 12. Pin 3 verifies the voltage level and pin 12 is used as a ground reference.

1. Power on the PC–680.
2. Run LCDBIAS.EXE.
3. A message similar to the following should appear on your display:

```
LCDBIAS v1.00
Copyright (c) 1995-2000 Octagon Systems Corporation


LCDBIAS TSR installed successfully
```

4. Press <CTRL><+> to raise the voltage or <CTRL><–> to lower the voltage. Raise or lower the voltage until you obtain a good contrast display with no washout.

   To confirm the LCD bias voltage, place a voltmeter on ground at J4, pin 12 and also on positive at J4, pin 3.

5. The VEESAFE voltage may require additional adjustments in order to obtain the proper contrast.

> **WARNING!**
>
> **Since improper voltage levels can severely damage the flat panel, make sure the PC–680 is configured for the correct bias voltage before it is connected to the panel.**

LCD bias control example

To change the flat panel bias voltage inside your application, use the INT 17h functions below. This only works from DOS with the INT17 extended BIOS installed.

1. LCDBIAS UP. Write the following program to move the voltage up one step:

```
mov      ah,0eeh    ; LCDBIAS control
mov      a1,00h     ; up
mov      dx,0ffffh
int      17h
```

2. LCDBIAS DOWN. Write the following program to move the voltage down one step:

```
mov       ah,0eeh    ; LCDBIAS control
mov       a1,01h     ; down
mov       dx,0ffffh
int       17h
```

Connecting the flat panel to the PC–680

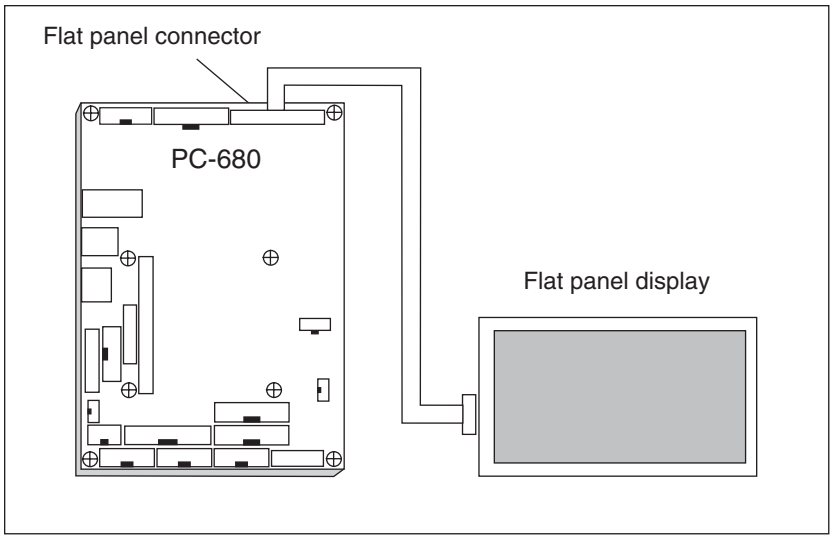
Text files are located on the 69000 utility disk. These text files include wiring diagrams specific to individual flat panels. Refer to the specific text file associated with your flat panel to build your cable. The maximum recommended cable length is 18 in.

1. Refer to the text file associated with your flat panel to determine the supply voltage for your panel.
2. Connect a cable from the flat panel to the flat panel connector located at J4 on your PC–680. Refer to Figure 11–3.

Warning

Improper wiring or connection from the flat panel to the PC-680 can damage the PC-680 and the flat panel. Verify the flat panel cable connections before connecting the cable to the PC-680 and applying power to the system.

Figure 11–3 The PC–680 and a flat panel display



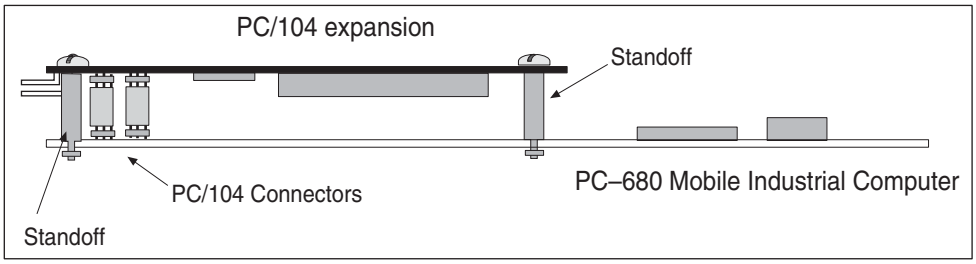
Note See *Appendix A - Connectors* for mating information.

Chapter 12: PC/104 expansion

≡ Description

This connector allows you to interface PC/104 form factor modules including A/D converters, digital I/O, serial ports, etc. The PC–680 supports 8– and 16–bit cards and provides ±12V from the power connector at J3**.** These modules can be stacked on top of the PC–680 to form a highly integrated control system. Octagon recommends only installing up to 2 PC/104 modules.

Figure 12–1 Typical PC/104 module stack



WARNING!

When installing any PC/104 module, avoid excessively flexing the PC–680 board. Mate pins correctly and use the required mounting hardware.

Note See *Appendix A - Connectors* for mating information.

Chapter 13: Ethernet

≡ Description

The PC–680 provides a 10/100BaseT Ethernet port and supports the IEEE 802.3 Ethernet standard. The Ethernet controller IC chip provides the following:

- Intel GD82559ER ethernet controller
- PCI interface
- 3 KB transmit buffer, 3 KB receive buffer
- Integrated 10BaseT / 100BaseT transceiver interface
- Two LEDs for link and traffic status
- Auto negotiating between full and half–duplex modes
- Auto negotiating between 10Mbps and 100Mbps

The PC–680 Ethernet uses twisted-pair wiring cable, which is built in a star configuration. The interface terminates at the standard, 8-position, RJ-45 latching phone jack.

The base address is automatically determined by the Ethernet drivers supplied on the Ethernet utility disk.

IRQ10 is the default interrupt, but can be reconfigured to IRQ 3, 4, 5, 7, 9, 10, 11, 12, 14, or 15 in BIOS setup. If you select a different interrupt, select one that does not conflict with another device.

For more information on using the Ethernet port, see the README.DOC on the PC–680 utility disk.

Table 13–1 Ethernet LEDs

Ethernet LED	Function
Green	Traffic
Amber	Link

Ethernet drivers

The PC680 Ethernet hardware is designed using an Intel GD82559ER controller IC. An acceptable "better than" controller is the Intel GD82559 controller IC and may be used interchangeably by Octagon

Systems. All drivers shipped with the PC680 are compatible with both controllers. If a customer wishes to develop custom device drivers for the Ethernet controller, it should be done so according to the GD82559ER specification to ensure compatibility with both the GD82559ER and GD82559.

The QNX 82559 ethernet driver, Net.ether82557, is available from QNX at:

http://www.qnx.com/products/hardware/network_support.html

The Linux 82559 ethernet driver is available from:

http://cesdis.gsfc.nasa.gov/linux/drivers/eepro100.html

The Intel EtherExpress Pro 100 is Intel's own Ethernet PCI card and it contains the same circuitry that used on the PC–680.

As of the current release of this manual, Octagon has not validated the Linux or QNX ethernet drivers on the PC–680 and is supplying this information as a courtesy only.

Chapter 14: USB

≡ Description

The PC–680 contains two Universal Serial Bus (USB) ports. USB is a hardware interface for low-speed peripherals such as the keyboard, mouse, joystick, scanner, printer and telephony devices. USB has a maximum transfer rate of 12 Mbits/sec, and up to 127 devices can be attached. Peripherals can be plugged in and unplugged without turning the system off.

Any USB device can be plugged directly into ether USB socket on the PC-680 or into a multi-port hub that then plugs into a PC-680 USB port. An operating system capable of utilizing USB or USB specific device drivers is required for USB operation.

Overview: *Section 3 – System management*

Section 3 provides information on managing the PC-680 in the areas of internal control, CPU power management, and troubleshooting. The following chapters are included:

Chapter 15: Watchdog timer and hardware reset
Chapter 16: Serial EEPROM and CMOS RAM
Chapter 17: User-defined jumper
Chapter 18: CPU power management
Chapter 19: Troubleshooting

Chapter 15: Watchdog timer and hardware reset

≡ Description

The watchdog timer is a fail–safe against program crashes or processor lockups. It has a programmable timeout period, ranging from 0.5 seconds to 64 seconds. The initial timeout period can be selected in BIOS setup and automatically initiated on power-up. INT17 software calls, a built–in function on the PC–680, are then used to enable and set the timeout, strobe, and disable the watchdog timer from your application. If the timer expires, it either performs a hardware reset (default), or will generate an NMI, depending on the position of the Power Fail Indicator jumper, W18.

Table 15–1 W18 Power Fail Indicator jumper

W18	Function
1-3	System Reset *
3-4	NMI

≡ Enhanced INT 17h function definitions

This section provides definitions for the following functions: Enable watchdog and set the timeout period, Strobe watchdog, and Disable watchdog.

Enable watchdog

Function: fdh

Subfunction: 01h

Purpose: To enable the watchdog and set the watchdog timeout period.

Calling registers:
AH fdh
AL 01h
DX ffffh
BX see table 16-2

Return registers: None

Comments: This function enables the watchdog and sets the timeout period. Once the watchdog is enabled, it has to be strobed before it expires or until the watchdog is disabled. Otherwise, a system reset will occur. The DX register defines the timeout period and is loaded with values between 0 and 7. Refer to Table 16-2.

Note If the BX value is undefined, the INT17 call will use what ever is in the BX register at the time. Any BX value over 7h will automatically set the timeout value to 4 seconds.

Note If the watchdog in enabled in BIOS setup, it should be re-enabled within the program using an INT17 call, redefining the timeout period. The strobe watchdog call takes it's reset value from the BX value defined in the enable watchdog call. If enable watchdog is never called, strobe watchdog assumes a 4 second timeout period.

Table 15–2 BX register values

BX register value (hex)	Timeout
0	.5 second
1	1 second
2	2 seconds
3	4 seconds
4	8 seconds
5	16 seconds
6	32 seconds
7	64 seconds

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
/* Enabling the watchdog at 16 second timeout */
asm {
mov  ax,0fd01h
mov  dx,0ffffh
mov  bx,0005h
int  17h
}
```

Strobe watchdog

Function: fdh

Subfunction: 02h

Purpose: To strobe the watchdog.

Calling registers: AH fdh
AL 02h
DX ffffh

Return registers: None

Comments: This function strobes the watchdog. Once the watchdog is enabled, it has to be strobed before it expires or until the watchdog is disabled. Other wise, a system reset will occur.

Note The strobe watchdog call takes it's reset value from the BX value defined in the enable watchdog call. If the watchdog is enabled in BIOS setup and is not redefined by the enable watchdog call, the watchdog strobe assumes a 4 second timeout.

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
asm {
mov ax,0fd02h
mov dx,0ffffh
int 17h
    }
```

The watchdog timer can also be strobed by reading address 20Bh. This may be faster than strobing the watchdog timer with an interrupt function call, for example:

```
inportb(0x20B); /* C code example */

mov dx,20Bh /* assembly code example */
in AL,DX
```

Disable watchdog

Function: fdh

Subfunction: 03h

Purpose: To disable the watchdog.

Calling registers: AH fdh
AL 03h
DX ffffh

Return registers: None

Comments: This function disables the watchdog.

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
asm {
     mov  ax,0fd03h
     mov  dx,0ffffh
     int  17h
   }
```

≡ Hardware reset

The PC–680 has a push button reset switch which allows you to reset the system without turning off the power. This provides a more complete reset than the <CTRL><ALT><DEL> method. The RESET command also accomplishes the same thing as the reset button. Refer to the component diagram in the *Quick start* chapter for the location of the reset button.

Note When using COM1 as the console, the <CTRL><ALT> <DEL> commands on the host system keyboard will only reset the host system. Use the RESET command to issue a hardware reset on the PC–680. W18[1-3] must be installed for RESET.COM to function correctly.

Chapter 16: Serial EEPROM and CMOS RAM

≡ Description

Up to 256 words of user-definable data can be saved in the serial EEPROM. The serial EEPROM does not require battery backup to maintain the data when the system power is off. The serial EEPROM is easily accessible via the enhanced INT 17h interface which is a built in function on the PC-680

≡ Enhanced INT 17h function definitions

This section provides definitions for both serial EEPROM and CMOS RAM functions. The serial EEPROM definitions include the following functions: Read a single word from serial EEPROM, Write a single word to serial EEPROM, Read multiple words from serial EEPROM, Write multiple words to serial EEPROM, and Return serial EEPROM size.

≡ Serial EEPROM

Read a single word from the serial EEPROM

Function: fch

Subfunction: 00h

Purpose: To read a single word from the on-board serial EEPROM.

Calling registers:
AH fch
AL 00h
BX Word address (zero based)
DX ffffh (relative to user area)

Return registers:
Carry flag cleared if successful
AX Word read
Carry flag set if error
AL Error code

Error code	Meaning
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM

03h	Illegal access

Comments: This function reads a word from the user area of the serial EEPROM.

Programming example:

```
/* Read word 2 */
unsigned int seeData;
/* Inline assembly code for Borland C++ 3.1 */
asm {
mov  ax,0fc00h
mov  bx,02h     /* Read word 2 */
mov  dx,0ffffh
int  17h
mov  seeData,ax /* store data in c environment */
  }
```

Write a single word to the serial EEPROM

Function: fch

Subfunction: 01h

Purpose: To write a single word to the on-board serial EEPROM.

Calling registers:

AH	fch
AL	01h
BX	Word address (zero based)
CX	Data word to write
DX	ffffh

Return registers:
Carry flag cleared if successful
Carry flag set if error
AL Error code

Error code	Meaning
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM
03h	Illegal access

Comments: This function writes a word to the user area of the serial EEPROM.

Programming example:

```
/* Write 0x1234 to word 3*/
unsigned int seeData = 0x1234;
/* Inline assembly code for Borland C++ 3.1 */
asm {
     mov  ax,0fc01h
     mov  bx,03h     /* Write word 3 */
     mov  cx,seeData /* Get write data from
                        c environment */
     mov  dx,0ffffh
```

```
        int   17h
    }
```

Read multiple words from the serial EEPROM

Function: fch

Subfunction: 02h

Purpose: To read multiple words from the on-board serial EEPROM.

Calling registers:
AH fch
AL 02h
BX Word address (zero based)
CX Word count
DX ffffh
ES:DI Destination pointer

Return registers:
Carry flag cleared if successful
AX Word read
Carry flag set if error
AL Error code

Error Code	Meaning
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM
03h	Illegal access

Comments: This function reads multiple words from the user area of the serial EEPROM.

Programming example:

```
/* Read 10 words starting at word 5 */
unsigned int far *seeDataPtr = new unsigned int[10];
/* Allocate storage*/
/* Inline assembly code for Borland C++ 3.1 */
asm {
    mov   ax,0fc02h
    mov   bx,05h     /* Read starts at word 5 */
    mov   cx,10      /* Read 10 words */
    mov   dx,0ffffh
    les   di,seeDataPtr
    int   17h
    }
```

Write multiple words to the serial EEPROM

Function: fch

Subfunction: 03h

Purpose: To write multiple words to the on-board serial EEPROM.

Calling registers: AH fch
AL 03h
BX Word address (zero based)
CX Word count
DX ffffh (user area relative address)
DS:SI Source pointer

Return registers: Carry flag cleared if successful
Carry flag set if error
AL Error code

Error Code	Meaning
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM
03h	Illegal access

Comments: This function writes multiple words to the user area of the serial EEPROM.

Programming example:

```
/* Write 8 words starting at word 6*/
unsigned int far *seeDataPtr = new unsigned int[8];
/* Allocate storage*/
    unsigned int far* tmpPtr = seeDataPtr;
    for(int  i=0;i<8;i++)
    *seeDataPtr = i;      /* initialize data */
/* Inline assembly code for Borland C++ 3.1 */
    asm {
    push ds
    mov  ax,0fc03h
    mov  bx,06h     /* Write starts at word 6 */
    mov  cx,8       /* Write 8 words */
    mov  dx,0ffffh
    lds  si,seeDataPtr
    int  17h
    pop  ds
       }
```

Return serial EEPROM size

Function: fch

Subfunction: 04h

Purpose: To obtain the size of the on-board serial EEPROM.

Calling registers: AH fch
AL 04h
DX ffffh

Return registers: Carry flag cleared if successful
AX Size of the serial EEPROM (in words)
BX Size available to user (in words)
Carry flag set if error

AL Error code

Error code	Meaning
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM
03h	Illegal access

Comments: This function returns the size (in words) of the serial EEPROM. Since the user cannot access all of the

serial EEPROM, this function determines how much space is available to the user. This avoids the user from accessing unavailable addresses.

Programming example:

```
unsigned int seeUserSize;
/* Inline assembly code for Borland C++ 3.1 */
asm {
     mov  ax,0fc04h
     mov  dx,0ffffh
     int  17h
     mov  seeUserSize,bx
     }
```

Chapter 17: User-defined jumper

≡ User-defined jumper

Jumper W26 [1-2] is a user-defined jumper. For program direction, read this jumper by code in your program.

Table 17–1 User option jumper: W26

W26	Function
1-2	User defined *
3-4	Enable on-board video*

* = default

Read jumpers

This section provides the definition for the Read jumpers function.

Function: fbh

Subfunction: 0Bh

Purpose: To read the on-board jumper settings.

Calling registers:

Ah	fbh
AL	0Bh
DX	ffffh

Return registers:

AL	Jumper information
bit	**state**
7	Not used
6	Not used
5	Not used
4	Not used
3	Not used
2	Not used
1	Not used
0	User option jumper A

Comments: This function returns the jumper settings.

Programming example:

```
/* The following example program reads the user de-
```

```
fined jumpers */
unsigned char jumpers;
/* Inline assembly code for Borland C++ 3.1 */
asm {
      mov      ax,0fb0bh
      mov      dx,0ffffh
      int      17h
      mov      jumpers, al
     }
    if(jumpers & A)      /* look at bit 0*/
       printf("User jumper UA installed\n);
    else
       printf("User jumper UA not installed\n);
```

Chapter 18: CPU power management

≡ Description

The power demands of a system can severely limit an application due to thermal constraints or the raw power usage in a battery–operated application. To maintain speed and efficiency, a software–controlled, power management system must be tailored to the application. Even if your application is operating within specified limits, a power management system may improve the life and reliability of your system by reducing thermal stress to the CPU.

≡ Power management overview

Power management is enabled in the PC–680 BIOS setup program in the Power Savings Menu and can be customized to your application. Press F2 during power up to enter BIOS setup. Refer to Table 18–1 for the Power Screen options.

Power Savings

Power savings is used to save power during periods of system inactivity. Power savings can be disabled, customized, use defaults for maximum power savings, or use defaults for maximum performance. Any interrupt, will return the system to the state it was in before it went into a power savings mode.

Customized

When the power savings is customized, you have control over the Idle Mode, Standby Timeout, Auto Suspend Timeout, Hard Disk Timeout, and Resume On Modem Ring.

Idle Mode

Idle mode can be either Off or On. This mode allows the system to monitor system activity)i.e. keyboard, video access, etc.) to determine when the system should be shut down. After 1 minute, the CPU clock stops, but he video and hard drives stay on.

Standby Timeout / Auto Suspend Timeout

Standby Timeout is used to select the timeout period desired before system inactivity causes the system to turn off the video and hard drives. Auto Suspend Timeout is similar to Standby Timeout and is included for compatibility.

Hard Disk Drive Timeout

Hard Disk Drive Timeout is used to select the timeout period desired before inactivity of the hard drive allows the hard drive to spin down.

Resume ON Modem Ring

Resume On Modem Ring allows the RI signal of COM1, COM2, COM3, or COM4 to resume system operation.

Maximum Power Savings

Maximum Power Savings uses preset timeouts for Standby Timeout, Auto Suspend Timeout, and Hard Disk Timeout. The only option available is Resume On Modem Ring.

Maximum Performance

Maximum Perfomance uses preset timeouts for Standby Timeout, Auto Suspend Timeout, and Hard Disk Timeout.

Thermal management

Thermal management of the CPU is provided by measuring the CPU temperature. Thermal and hysteresis setpoints, throttle speed, and fan control are all used to regulate the temperature of the CPU.

WARNING!

Due to the heat generated by the Pentium processor, it is highly recommended that thermal management is always enabled. and the CPU *not* run in "full on" condition. If thermal management is enabled, the PC–680 will operate to the published temperature specifications. If thermal management is disabled, care must be taken not to damage or shorten the life of the CPU. Adequate ventilation, preferably with a fan and ample room around the CPU and case must be provided. Please contact Octagon Technical Support if the thermal management is to be disabled to discuss your situation.

Thermal Setpoint

Thermal Setpoint is the temperature in which the CPU will throttle back to the speed determined in Throttled Speed. The fan will also turn on if Fan Control is enabled. The range is 0 - 255 C. The default is 85 C.

Thermal Hysterises

Thermal Hysterises is the temperature in which the CPU will return to full speed from the throttled speeded. The fan will also turn off if Fan Control is enabled. The range is 0 - 255 C. The default is 65 C.

Fan Control

Fan Control allows power to be conserved if the fan operation is not required all of the time. The Thermal Setpoint and Thermal Hysterises selections determine when the fan turns on or turns off. If Fan Control is disabled and a fan is installed, the fan will run continuously.

Table 18–1 PC–680 BIOS setup Power Screen options

BIOS Setup	Options / Defaults
Power Screen	
Setup Parameters	
Power Savings:	Disabled * Customized Maximum Power Savings Maximum Performance Enabled
Customized	
Idle Mode:	Off * On
Standby Timeout:	Off * 1 Min., 2 Min., 4 Min., 6 Min., 8 Min., 12 Min., 16 Min.
Auto Suspend Timeout:	Off * 5 Min., 10 Min., 15 Min., 20 Min., 30 Min., 40 Min., 60 Min.
Hard Disk Timeout:	Disabled * 10 Sec., 15 Sec., 30 Sec., 45 Sec., 1 Min., 2 Min., 4 Min., 6 Min., 8 Min., 10 Min., 15 Min.
Resume On Modem Ring:	Off * On Enabled
Maximum Power Savings	Off * On Enabled
Maximum Performance	Off On * Enabled
Thermal Setpoint (C) :	0 - 255
Hysteresis Setpoint (C):	0 - 255
Throttled Speed:	Disabled 12.5%, 25%, 37.5%, 50% *, 62.5%, 75%, 87.5%
Fan Control:	Disabled * Enabled
Watchdog Mode:	Disabled * Enabled
Watchdog Delay:	8.0 sec. *, 16.0 sec., 32.0 sec., 64.0 sec.

* = default

Chapter 19: Troubleshooting

If your system is not working properly, check the following items:

No screen activity – checking console serial communications

If you do not get the sign-on message after bootup:

1. Make sure all PC/104 expansion cards are removed from the PC-680. This ensures that other cards are not interacting with the PC-680.
2. Change W26[3-4]. Depending upon your current ROM enable and jumper state, this jumper disables the video section. See the *Console devices* chapter for further instructions on how to enable/disable the video BIOS device.
3. Check the "B" W7[1-2], and "P" W7[7-8] jumpers. If "B" is installed and "P" is removed, SSD1P is selected which has the standard VGA BIOS (no flat panel is supported).
4. The VTC-20F serial cable turns the PC-680 serial port into a 9-pin AT serial port. Make sure a null modem adapter is installed on the other end, and that the assembly is inserted into the proper serial port on the PC. Make sure the VTC-20F serial cable is connected to J13 of the PC-680 and you are connected to the COM1 connector.
5. Make sure your power module provides +5V (+/-0.25V) and at least 5A of current. Ideally the power will be adjusted to 5.1V. Monitor the power when the PC-680 is turned on. If at any time the power drops below 4.75V the power monitor circuit will initiate a system reset.
6. After verifying the above conditions, you can monitor voltage levels by connecting an oscilloscope between the TxD* line on J13 (pin 5) and ground. After powerup, you should see a burst of activity on the oscilloscope screen. The voltage level should switch between +/-8V. This test verifies that the CPU is active and that the transmit from COM1 is functional.

Garbled serial console screen activity

If you do get activity on your console screen but the message is garbled, check the following:

1. Remove "S" W7[9-10] jumper to force 38400, N, 8, 1 for COM1.
2. If you are using a terminal emulator, make sure you have configured the software for 38400 baud, 8 bits, 1 stop bit, no parity, ANSI emulation, and have selected the correct serial port for communicating with your PC.

System generates a BIOS message but locks up when booting from SSD1

1. Remove the "S" W7[9-10] jumper and reboot. When flash file system prompts you, select SSD1 as the first drive and SSD0 as the second drive.
2. Display the directory of SSD1 and verify that all the necessary boot files exist. Copy any missing files to SSD1.
3. If no files are missing, remake SSD1 to overwrite any files which may have become corrupted. In addition, you may want to do a **FXFMT** and **SYS** to SSD1.
4. If SSD1 does not boot, install a floppy in the system, reboot from it, and remake SSD1.

Flash file reports a drive, but issuing a DIR generates an error message

1. The SSD may not be formatted. The program, FXFMT may have to be run. For more information, see the *SSDs, DRAM, and battery backup* chapter.

Flash file does not report the drive

1. Run SETSSD and make sure it is correct.
2. Make sure that the "X" W7[3-4] jumper is installed or that FXDOS.SYS is in your CONFIG.SYS file of your floppy or hard drive boot device.
3. Make sure that the "S" W7[9-10] jumper is installed.
4. Reboot your system.

System will not recognize hard drive

1. Run BIOS setup and confirm that on-board IDE interface is enabled.
2. Try changing Primary Master Fixed Disk to User and specify Heads, Sectors, and Cylinders.
3. Make sure the hard drive is not configured as a slave drive.

System locks up after powerdown/powerup

If the power supply does not drain below 0.7V, the CMOS components on the card will act like diodes and forward bias. This is typically caused by using power supplies that have large output capacitors. Either use a different power supply that discharges faster, leave the power off until the supply has adequate time to discharge or place a 100 ohm, large wattage resistor across the output capacitor.

≡ Technical assistance

Carefully recheck your system before calling Applications Support. Run as many tests as possible; the more information you can provide, the easier it will be for the Applications Support staff to help you solve the problem.

For technical assistance, please call 303-426-4521.

≡ POST Codes

Table 19–1 POST Codes

Code	Cold/ Warm	Beeps	Description
02	B		Verify entered POST in real mode
C8	C		Platform specific FLASH initialization
C9	C		Verify extended BIOS checksum
1C	W		Initialize and test programmable interrupt controller
12	W		Load CR0 register from CMOS save location
13	W		Reset PCI devices to disable bus master devices on warm start
36	W		Determine which warm start shutdown sequence to perform
24	B		Convert all segment limits to 4GB
03	W		Disable NMIs following a warm start
0A	W		Set CPU registers to default power up values
04	B		Determine the CPU type
AE	W		Clear the In Post flag
06	B		Reset DMA controllers, disable video, clear any pending interrupts from the real time clock
18	B		Initialize the three 8254 timers
07	B		Disable system ROM shadow and run FLASH ROMEXEC if present
08	B		Initialize the chipset registers to default startup values
C4	B		Initialize system error handler and zero System Error flags
11	B		Initialize any platform specific registers not in the chipset
0E	B		Initialize I/O related registers (disable serial and parallel ports)
0C	B		Initialize cache control registers to default startup values
16	C	1-2-2-3	Verify that the ROM BIOS checksums to zero
17	B		Prepare chipset for DRAM autosizing
28	B		Size installed DRAM
2A	B		Clear the base DRAM
2C	C	1-3-4-1	Perform address line tests on the installed RAM
2E	C	1-3-4-3	Test the first 64K of base RAM
0A	C		Set CPU registers to default power up values
3A	B		Determine size of installed cache
2F	B		Disable cache prior to shadowing the system BIOS
38	B		Decompress and shadow the system BIOS and decompress option
20	C	1-3-1-1	Verify that DRAM refresh is working
29	B		Initialize POST memory manager data structures
33	B		Initialize POST display manager data structures
C1	B		Initialize POST error manager data structure
09	B		Turn on internal flag indicating that the POST is in progress
3A	B		Determine size of installed cache (Alternate late initialization)
0B	B		Enable CPU cache
0F	B		Initialize the fixed disk controller
10	B		Initialize Power Management controls

W = Warm Start Only C = Cold Start Only B= Both Warm and Cold Start

Table 19–2 POST Codes (continued)

Code	Cold/ Warm	Beeps	Description
14	C		Initialize 8742 keyboard controller
1A	B		Initialize and test DMA registers
1C	B		Initialize and test programmable interrupt controller
22	C	1-3-1-3	Test the keyboard controller
32	B		Compute the CPU clock speed
67	B		Optional multi-processor initialization
69	B		Initialize SMI memory space
6B	B		Load custom defaults
3C	B		Optimize chipset timing
3D	B		Optimize platform specific hardware
42	B		Initialize interrupt vectors
46	C	2-1-2-3	Verify the copyright notice
45	B		Run device initialization routines
47	B		Initialize I2O features (Optional)
49	B		Initialize and configure PCI devices
C6	B		Initialize docking (Optional)
C5	B		Initialize docking configuration data (Optional)
48	B		Verify hardware configuration and check for mono or color video
4A	B		Initialize the video and select the video device used to boot the system (ISA video is given priority, if installed. Otherwise, PCI video is used. Onboard PCI video is lowest priority).
4C	B		Shadow the video BIOS
24	B		Convert all segment limits to 4GB
59	B		Initialize the POST display service
CC	B		Initialize Serial Video feature
55	B		Initialize USB
22	W		Test the keyboard controller
52	B		Test and initialize the keyboard
54	B		Initialize POST keystroke clicker
76	C		Enable the keyboard
58	B	2-2-3-1	Check for active interrupt requests
3F	B		RomPilot initialization (Optional)
4B	B		Initialize quiet boot
4E	B		Display the copyright notice
50	C		Display the CPU type
9D	B		Initialize the system security engine
5A	B		Display prompt "Press F2 to enter SETUP"
5B	C		Disable the CPU cache
5C	C		Size and test the system memory
60	C		Size and test the extended memory
62	C		Test extended memory address lines

W = Warm Start Only C = Cold Start Only B= Both Warm and Cold Start

Table 19–3 POST Codes (continued)

Code	Cold/ Warm	Beeps	Description
64	B		Optional OEM defined POST test 1
66	B		Enable the secondary cache
68	B		Optimally configure the secondary cache
6A	C		Display the secondary cache size if a cache was detected and enabled.
6C	C		Display size of shadow RAM
6E	C		Display starting address of non-disposable BIOS - This value determines the highest address that can be assigned for UMB's.
70	B		Display any POST errors
72	B		Check for configuration errors
4F	B		Initialize Multiboot feature
7C	B		Set up hardware interrupt vectors
7E	B		Test coprocessor if present
96	W		Return to standard real mode
80	B		Disable programmable I/O devices
CA	B		Initialize Serial Keyboard feature
88	B		Initialize timeouts, key buffer, and soft reset flag
8A	B		Initialize the extended BIOS data area
81	B		Call all late POST device initialization routines (Optional)
87	B		Call the configuration routine for each MCD device
85	B		Init PC-compatible PNP & PCI devices (COM LPT floppy etc.)
82	B		Detect and install fixed RS232 ports
84	B		Detect and install fixed parallel ports
86	B		Re-enable programmable I/O and check for conflicts with fixed I/O
83	B		Configure non-MCD IDE controllers
89	B		Enable NMIs
8C	B		Initialize floppy disk controllers and drives
90	B		Initialize hard disk controllers and drives
8B	B		Initialize and test for the presence of a mouse pointing device
95	B		Initialize CD ROM device
92	B		Optional OEM defined POST test 2
B6	B		Early check for password (Optional)
98	B	1-2	Scan for BIOS ROM extensions. One long, two short beeps on checksum error.
93	B		Late multi-processor initialization (Optional)
9C	B		Set up Power Management
C7	B		Late docking initialization (Optional)
9E	B		Enable hardware interrupts
A0	B		Set BIOS time from real time clock
A2	B		Check for key lock
A4	B		Initialize keyboard typematic rate (Optional)
C2	B		Sequentially invokes each registered error logging function

W = Warm Start Only C = Cold Start Only B= Both Warm and Cold Start

Table 19–4 POST Codes (continued)

Code	Cold/ Warm	Beeps	Description
BA	B		Execute DMI handlers
C3	B		Sequentially invokes each registered error display function
A8	B		Erase F2 prompt
AA	B		Check to see if F2 key was pressed
AC	B		Optionally print "Press F1 or F2" prompt and/or enter SETUP (DISABLED)
AE	B		Clear the In Post flag
B0	B	2	Check for errors - beep twice if error and setup prompt displayed.
B2	B		Prepare to boot
B4	B	1	Beep once
B5	B		Terminate quiet boot
BE	B		Optionally clear the screen
B6	B		Late password check (Optional)
BC	B		Clear parity checkers
B7	B		Setup ACPI table in shadow and extended RAM (Optional)
BD	B		Display Boot First menu
BF	B		Check reminder features
8F	B		Initialize BIOS data prior to ATA fixed disk initialization
91	B		Perform ATA fixed disk fast initialization for high-performance drives
9F	B		Restore total ATA and SCSI disk count to BIOS
99	B		Check SMART status (Optional)
B1	B		Unload RomPilot after Setup
B9	B		Clean up various display items prior to boot
C0	B		Try to boot via INT 19

W = Warm Start Only C = Cold Start Only B= Both Warm and Cold Start

Overview: *Section 4 – Appendices*

Section 4 contains a series of appendices which provides additional information about the PC-680.

Appendix A: Technical data
Appendix B: Software utilities
Appendix C: Third party support
Appendix D : Accessories
Appendix E: Operation in severe environments

Appendix A: Technical data

≡ Technical specifications

CPU

Intel Pentium 166 MHz with MMX technology,
Intel Pentium 266 MHz with MMX technology,
or AMD K6 333 MHz

PCI bus speed

33 MHz

ISA bus speed

8.33 MHz

SDRAM

0 MB installed on–board, expandable up to 128 MB with a 144-pin SO-DIMM

SSD0

32-pin DIP socket supports a 512K EPROM, 512K flash, 512K SRAM, or M–Systems DiskOnChip. Not populated

SSD1

4 MB flash soldered on–card, 8MB OEM option

SSD2

8 MB flash (not populated, available as an OEM option)

Floppy drive

Supports 360KB, 720KB, 1.2MB, or 1.44MB floppy drives

EIDE drives

EIDE hard drive and ATAPI CD-ROM drive support via 2 mm connector

Video

Chips and Technology 69000 video controller
XVGA on PCI bus, with CRT interface, flat panel interface, GUI accelerator, and an adjustable bias supply for LDC contrast control

10/100Base–T Ethernet port

Intel GD82559ER ethernet controller
IEEE 802.3 Ethernet standard
PCI interface
3 KB transmit buffer, 3 KB receive buffer
Integrated 10 BaseT/100BaseTX transceiver interface
Two LEDs for link and traffic status
Auto negotiating between full and half–duplex modes
Auto negotiating between 10Mbps and 100Mbps

Serial I/O

COM1 through COM6:
IEC1000, level 3, ESD protection specification
— Contact discharge ±6 kV
— Air–gap discharge ±8 kV
Backdrive protection
16C550 compatible
Up to 115.2K baud
16–byte FIFO buffers

Parallel port

Mulitfunctional LPT1 port:
Unidirectional
Bidirectional
IEEE 1284, ECP and EPP modes
14 mA of drive current
Backdrive protection

Digital I/O

32 lines of industrial, digital I/O. Each I/O is a terminated, bidirectional line that can be individually configured as an input, input with event edge sensing, input with level sensing, output, or output with readback. Inputs can generate interrupts or can be polled. The lines are 5V compatible and can sink 25mA. Each line has a 4.7kW termination resistor, ESD, and over/under shoot protection. An interrupt can be generated from any of the 32 inputs. This interrupt can be enabled, disabled, and made to interrupt on a rising or falling event/edge.

USB

The PC–680 contains two UHCI Universal Serial Bus ports

Speaker

PC compatible speaker connector for 4-50 ohm speaker

Keyboard, mouse port

PS/2 style keyboard compatible connector.

The mouse port is combined with the keyboard port and is accessed with a notebook computer "y" cable.

PC/104 interface

Standard 16-bit PC/104 interface

Battery backup

3.6V AT style battery connector

Watchdog timer

Programmable from .5 second to 64 seconds

Bus mastering

Bus mastering is not supported

BIOS

Phoenix BIOS with Octagon industrial extensions

ROM–DOS

DOS 7.0 compatible

Power requirements

5V ±0.25V
Pentium 166 MHz processor

Normal:	1.6A typical
50% CPU speed	1.4A typical
12.5% CPU speed	1.1A typical
Suspend:	1.0A typical

The power supply for the PC–680 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This ensures that all the circuitry on the PC-680 sequences properly and avoids system lockup.

Pentium 266 MHz processor

	without fan*	**with fan**
Normal:	1.7A typical	1.8 A typical
50% CPU speed	1.75A typical	1.8A typical
12.5% CPU speed	1.75A typical	1.8A typical
Suspend:	.88mA typical	.92mA typical

*When operating the CPU above 40° C the CPU heatsink and fan assembly should be installed

AMD K6, 333 MHz processor

Normal:	3.0A typical
50% CPU speed	2.0A typical
12.5% CPU speed	1.2A typical
Suspend:	1.0A typical

+12V and –12V supplied to PC/104 connector and display connector; not required for PC–680 operation

Voltage supervisor

Reset threshold: +5V supply > 4.65V typical

Environmental specifications

Operating temperature

PC–680 using low power 166 MHz Intel CPU

–40° to 85° C operating temperature using temperature monitoring/control of CPU. Temperatures above 45°C require installation of a heatsink or heatsink/fan assembly depending on available airflow. For additional information on low power embedded Pentium processors, order Intel specification document #273184-003 from Intel.

PC–680 using a 266 MHz Intel CPU or a 333 MHz AMD K6 CPU with heatsink and fan

–40° to 70° C operating

(temperatures above 40° C require installation of a heatsink and fan)

Nonoperating temperature	–55° to 90°C, nonoperating
Relative humidity	5% to 95% noncondensing
Altitude	–100 to 10,000 m
Shock	40g, 3 axis
Vibration	6g, 3 axis

Size

5.75" x 8.00", height is dependent on CPU and fan assembly used

Table A–1 PC–680 memory map

Address	Description
00000h-9FFFFh	System memory
A0000h-BFFFFh	Legacy video memory
C0000h-CBFFFh	Video BIOS area
CC000h-CDFFFh	8K SSD0 window
CE000h-CFFFFh	8K SSD1/SSD2 window
D0000h-D7FFFh	32K extended BIOS area
D8000h-DBFFFh	Off card
DC000h-DFFFFh	32K legacy KB BIOS area
E0000h-FFFFFh	128K BIOS area
100000h-1FFFFFFh	512MB addressable extended memory

Table A–2 PC–680 I/O address map

Address	Description
0000-00A7h	System I/O functions
0120-012Fh	Digital I/O
0208-0208h	Scratch pad register
0209-020Bh	Watch dog control
020C-020Fh	Interrupt status registers
02E8-02EFh	Serial port COM4
02F8-02FFh	Serial port COM2
0320-0327h	Serial port COM5
0328-032Fh	Serial port COM6
0378-037Bh	Parallel port
03E8-03EFh	Serial port COM3
03F8-03FFh	Serial port COM1
04A8-04A8h	SSD control register
04A9-04A9h	Serial EEPROM control register
04AA-04AAh	I/O port control register
04AB-04ABh	OctaGlue FPGA I.D. register
04AC-04AEh	SSD window control registers
04AF-04AFh	Scratch pad register

Table A–3 PC–680 jumper configurations

Function	Reference Designator	Setting	Description
CPU Clock Ratio	W3	all removed	2/5 bus/core ratio
		3-4	for 266 MHz Intel Pentium **
		1-2, 3-4	2/3 bus/core ratio
		1-2	1/3 bus/core ratio
		5-6	1/4 bus/core ratio
		1-2, 3-4, 5-6	for 166 MHz Intel Pentium **
		3-4, 5-6	for 333 MHz AMD K6 **
CPU Core Voltage	W4	1-2, 5-6, 7-8	3.3V
		1-2, 3-4, 7-8	3.1V
		3-4, 7-8	3.0V
		1-2, 7-8	2.9V
		7-8	2.8V
		1-2, 3-4, 5-6	2.7V
		3-4, 5-6	2.6V
		1-2, 5-6	2.5V
		3-4	2.2V - 333 MHz AMD K6-2E **
		1-2	2.1V
		3-4, 5-6, 7-8, 9-10	2.0V
		5-6, 7-8, 9-10	1.9V - 166/266 MHz Intel Pentium **
		3-4, 7-8, 9-10	1.8V
Digital I/O Termination	W5	2-4	Bits 0-7 Pull up (+5V) *
		4-6	Bits 0-7 Pull down (GND) (Pin 4 nc for bits 0-7 float)
		1-3	Bits 8-15 Pull up (+5V) *
		3-5	Bits 8-15 Pull down (GND) (Pin 3 nc for bits 8-15 float)
		9-11	Bits 16-23 Pull up (+5V) *
		7-9	Bits 16-23 Pulldown (GND) (Pin 9 nc for bits 16-23 float)
		10-12	Bits 24-31 Pull up (+5V) *
		8-10	Bits 24-31 Pull down (GND) (Pin 8 nc for bits 24-31 float)
User Options	W7	1-2	"B" BIOS device on=SSD1 *, off=SSD0
		3-4	"X" Extended BIOS on=enabled *, off=disabled
		5-6	Unused
		7-8	"P" protected BIOS on= protected *, off= unprotected
		9-10	"S" use SETUP selections *

* = default
** = board dependent

Table A–4 PC–680 jumper configurations (continued)

Function	Reference Designator	Setting	Description
COM3 Configurations	W12	3-4, 5-6, 7-8 , 9-10	RS-232 *
	W13	1-2, 3-4, 7-9, 8-10	RS-422 w/o termination
	W12	1-2	RS-422 with termination
	W13	1-2, 3-4, 7-9, 8-10	
	W8	1-2, 3-4	RS-485 w/o termination
	W13	7-9, 8-10	
	W8	1-2, 3-4	RS-485 with termination
	W12	11-12	
	W13	7-9, 8-10	
COM4 Configurations	W10	3-4, 5-6, 7-8, 9-10	RS-232 *
	W11	1-2, 3-4, 7-9, 8-10	RS-422 w/o termination
	W10	1-2	RS-422 with termination
	W11	1-2, 3-4, 7-9, 8-10	
	W6	1-2, 3-4	RS-485 w/o termination
	W11	7-9, 8-10	
	W6	1-2, 3-4	RS-485 with termination
	W10	11-12	
	W11	7-9, 8-10	
Power Fail Indicator	W18	1-3	System Reset *
		3-4	NMI
SSD0 Device Type	W20	2-4	All others (see W21)
		3-4	SRAM *
SSD0 Device Type	W21	1-2, 5-7, 9-10	Flash
		5-7	DOC
		1-2, 4-6, 8-10	SRAM *
		1-3, 2-4, 9-10	EEPROM
GPS Antenna Power	W24	1-2	+5V *
		2-4	+12V
User Option	W26	1-2	User option jumper *
Video	W26	3-4	on = use on board video * off = disable on-board video

* = default

Table A–5 COM1 - COM6 serial ports

COM Port	Port Type	Handshake Lines	I/O Address	Interrupt	Connector
COM1	RS-232	8 lines, ground	2E8h 2F8h 3E8h 3F8h*	IRQ3 IRQ4*	J7 (shared with COM2)
COM2	RS-232	8 lines, ground	2E8h 2F8h* 3E8h 3F8h	IRQ3* IRQ4	J7 (shared with COM1)
COM3	RS-232* RS-422 or RS-485	4 lines, ground	3E8h	IRQ9 IRQ10* IRQ11 or no IRQ	J10 (shared with COM4)
COM4	RS-232* RS-422 or RS-485	4 lines, ground	2E8h	IRQ9 IRQ10* IRQ11 or no IRQ	J10 (shared with COM3)
COM5	RS-232* or TTL levels for GPS	4 lines, ground	320h	IRQ9 IRQ10 IRQ11* or no IRQ	J14 - RS-232, J19 - GPS TTL (shared with COM6)
COM6	RS-232* or RTCM SC-104 for GPS	4 lines, ground	328h	IRQ9 IRQ10 IRQ11* or no IRQ	J14 - RS-232, J19 - GPS RTCM (shared with COM5)

* = default

Note Addresses and IRQs are selected in SETUP, port type is selected by jumpers.

Table A–6 LPT1 port

LPT1 port addresses	**IRQ**	**Connector**
278h	IRQ5	J16
378h *	IRQ7 *	
3BCh		

* = default

Table A–7 Digital I/O port

Digital I/O port address	**IRQ**	**Connector**
100h, 120h *	IRQ15 *	J6 - I/O lines 0 - 23
		J5 - I/O lines 24 - 32

* = default

≡ Connectors

Table A–8 Connectors and matingrecepticles

Connector	Name	Description	Mating receptacle
J1	Fan	2-pin, in-line connector	Molex #50-57-9002
J2 J13 J21	Speaker Battery Opto input	4-pin, in-line connector	DuPont BERG #65039-033 housing #48235-000 crimp to wire pins
J3	Power	6 pin header	Molex #2139 housing #2478 crimp terminal
J4	Flat panel	50 pin shrouded header	Samtec #TCSD-25-01-N
J5 J6 J17	Digital I/O Digital I/O LPT printer	26-pin shrouded header	AMP #746288-6 receptacle #499252-3 strain relief
J7 J10 J14	COM1 / COM2 COM3 / COM4 COM5 / COM6	20-pin shrouded header	AMP #746288-4 receptacle #499252-2 strain relief
J8	PC video	60-pin shrouded header	AMP #1-111196-2 receptacle
J9	PC/104 interface	PC/104 8 or 16 bit receptacle	Samtec #ESQ-132-14-G-D (8 bit) #ESQ-120-14-G-D (16 bit)
J11	Floppy	34-pin shrouded header	AMP #746288-8 receptacle #499252-6 strain relief
J12	SVGA CRT analog	16-pin shrouded header	AMP #746288-3 receptacle #499252-8 strain relief
J15	Ethernet	RJ-45 receptacle	
J16	USB	Type A receptacle	

J18	IDE hard drive	44-position
		2mm x 2 header
			Samtec
			#TCSD-25-D-XX-01-F-N
			XX = length of cable in inches

J19	GPS	10-pin shrouded header	AMP #746288-1 receptacle #499252-5 strain relief
J20	Keyboard / Mouse	6-pin DIN receptacle	AMP #212437-4 shield/housing #212435-7 ferrule #66728-5 pin contacts #212800-1 cord guard

≡ Connector pinouts

Table A–9 Fan: J1

Pin	Function
1	Switched +5V
2	Gnd

Table A–10 Speaker: J2

Pin	Function
1	Speaker drive
2	NC
3	Gnd
4	+5V Safe

Table A–11 Power: J3

Pin	Function
1	Gnd
2	+5V
3	+12V
4	-12V
5	+5V
6	Gnd

Table A–12 Flat panel: J4

Pin	Function	Pin	Function
1	VDDSAFE +5V	2	+12VSAFE
3	LCDBIAS	4	Gnd
5	ENAVEE	6	PD24
7	M	8	Blank
9	PD25	10	LP
11	FLM	12	Gnd
13	BSHFCLK	14	PD26
15	PD0	16	PD1
17	PD27	18	PD2
19	PD3	20	PD28
21	PD4	22	PD5
23	Gnd	24	PD6
25	PD7	26	PD29
27	PD8	28	PD9
29	PD30	30	PD10
31	PD11	32	PD31
33	PD12	34	PD13
35	Gnd	36	PD14
37	PD15	38	PD32
39	PD16	40	PD17
41	PD33	42	PD18
43	PD19	44	PD34
45	PD20	46	PD21
47	PD35	48	PD22
49	PD23	50	Gnd

Table A–13 Digital I/O: J5, J6

	J6 Digital I/O					J5 Digital I/O	
Pin	**Function**	**Pin**	**Function**	**Pin**	**Function**	**Pin**	**Function**
	Port 0		**Port 1**		**Port 2**		**Port 3**
19	bit 0	10	bit 0	13	bit 0	19	bit 0
21	bit 1	8	bit 1	16	bit 1	21	bit 1
23	bit 2	4	bit 2	15	bit 2	23	bit 2
25	bit 3	6	bit 3	17	bit 3	25	bit 3
24	bit 4	1	bit 4	14	bit 4	24	bit 4
22	bit 5	3	bit 5	11	bit 5	22	bit 5
20	bit 6	5	bit 6	12	bit 6	20	bit 6
18	bit 7	7	bit 7	9	bit 7	18	bit 7
2	+5VDC Safe					2	+5VDC Safe
26	Gnd					26	Gnd

Table A–14 COM1 / COM2: J7

Port	**Pin**	**RS-232C**	**Port**	**Pin**	**RS-232C**
	1	DCD		11	DCD
	2	DSR		12	DSR
	3	RXD		13	RXD
	4	RTS		14	RTS
COM1	5	TXD	COM2	15	TXD
	6	CTS		16	CTS
	7	DTR		17	DTR
	8	RI		18	RI
	9	GND		19	GND
	10	NC		20	NC

Table A–15 PC video: J8

Pin	Function	Pin	Function
1	NC	2	Gnd
3	NC	4	Gnd
5	NC	6	Gnd
7	NC	8	Gnd
9	VLCK	10	Gnd
11	VREF	12	Gnd
13	HREF	14	Gnd
15	NC	16	Gnd
17	NC	18	Gnd
19	VSYNC	20	Gnd
21	HSYNC	22	Gnd
23	NC	24	Gnd
25	NC	26	Gnd
27	NC	28	Gnd
29	NC	30	Gnd
31	Key	32	Gnd
33	VP12	34	VP13
35	Gnd	36	VP14
37	VP15	38	Gnd
39	VP6	40	VP7
41	Gnd	42	VP8
43	VP9	44	Gnd
45	VP10	46	VP11
47	Gnd	48	VP0
49	VP1	50	Gnd
51	VP2	52	VP3
53	Gnd	54	VP4
55	VP5	56	Gnd
57	NC	58	NC
59	NC	60	NC

Table A–16 PC/104: J9

Pin	Row A	Row B	Row C	Row D
0	—	—	Gnd	Gnd
1	IOCHK*	Gnd	SBHE*	MEMCS16*
2	SD7	RESETDRV	LA23	IOCS16*
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	NC	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ15
7	SD2	–12V	LA18	IRQ14
8	SD1	0 WS**	LA17	DACK0*
9	SD0	+12VDC	MEMR*	DRQ0
10	IOCHRDY	Key	MEMW*	DACK5*
11	AEN	SMEMW*	SD8	DRQ5
12	SA19	SMEMR*	SD9	DACK6*
13	SA18	IOW*	SD10	DRQ6
14	SA17	IOR*	SD11	DACK7*
15	SA16	DACK3*	SD12	DRQ7
16	SA15	DRQ3	SD13	+5V
17	SA14	DACK1*	SD14	Master*
18	SA13	DRQ1	SD15	Gnd
19	SA12	Refresh*	Key	Gnd
20	SA11	SYSCLK	—	—
21	SA10	IRQ7	—	—
22	SA9	IRQ6	—	—
23	SA8	IRQ5	—	—
24	SA7	IRQ4	—	—
25	SA6	IRQ3	—	—
26	SA5	DACK2*	—	—
27	SA4	TC	—	—
28	SA3	Bale	—	—
29	SA2	+5V	—	—
30	SA1	14 MHz	—	—
31	SA0	Gnd	—	—
32	Gnd	Gnd	—	—

* = active low; ** = wait state

Table A–17 COM3 / COM4: J10

Port	Pin	RS-232C	RS-422	RS-485
	1		TX+	DATA+
	2		TX–	DATA–
	3	RXD		
	4	RTS		
COM3	5	TXD		
	6	CTS		
	7		RX+	
	8		RX–	
	9	GND	GND	GND
	10	NC	NC	NC
	11		TX+	DATA+
	12		TX–	DATA–
	13	RXD		
	14	RTS		
COM4	15	TXD		
	16	CTS		
	17		RX+	
	18		RX–	
	19	GND	GND	GND
	20	NC	NC	NC

Table A–18 Floppy port: J11

Pin	Function	Pin	Function
1	Gnd	2	DSEL
3	Gnd	4	NC
5	Gnd	6	NC
7	Gnd	8	INDEX*
9	Gnd	10	MTR1 ON*
11	Gnd	12	DS2*
13	Gnd	14	DS1*
15	Gnd	16	MTR2 ON*
17	Gnd	18	DIR IN*
19	Gnd	20	STEP*
21	Gnd	22	WR DATA*
23	Gnd	24	WR GATE*
25	Gnd	26	TRK 00*
27	Gnd	28	WP*
29	Gnd	30	RD DATA*
31	Gnd	32	SIDE 1*
33	Gnd	34	DISKCHANGE

* = active low

Table A–19 SVGA CRT: J12

Pin	Function	Pin	Function
1	Red	2	Green
3	Blue	4	NC
5	Gnd	6	Gnd
7	Gnd	8	Gnd
9	+5V Safe	10	Gnd
11	NC	12	DDCD
13	Horizontal sync	14	Vertical sync
15	Clk DDC	16	Gnd

Table A–20 Battery: J13

Pin	Function
1	Battery
2	Key
3	Gnd
4	Gnd

Table A–21 COM5 / COM6: J14

Port	Pin	RS-232C	Port	Pin	RS-232C
	1	nc		11	nc
	2	nc		12	nc
	3	RXD		13	RXD
	4	RTS		14	RTS
COM5	5	TXD	**COM6**	15	TXD
	6	CTS		16	CTS
	7	nc		17	nc
	8	nc		18	GND
	9	GND		19	nc
	10	nc		20	nc

Table A–22 Ethernet: J15

Pin	Description
1	Tx+
2	Tx-
3	Rx+
4	NC
5	NC
6	Rx-
7	NC
8	NC

Table A–23 USB: J16

Pin	Description	Pin	Description
1A	VCC	1B	VCC
2A	Data1-	2B	Data2-
3A	Data1+	3B	Data2+
4A	Gnd	4B	Gnd

Table A–24 LPT: J17

Pin	Function	Pin	Function
1	STB*	14	Gnd
2	AFD*	15	DATA6
3	DATA0	16	Gnd
4	ERR*	17	DATA7
5	DATA1	18	Gnd
6	INIT*	19	ACK*
7	DATA2	20	Gnd
8	SLIN*	21	BUSY
9	DATA3	22	Gnd
10	Gnd	23	PE
11	DATA4	24	Gnd
12	Gnd	25	SLCT
13	DATA5	26	+5V Safe

* = active low

Table A–25 IDE hard drive: J18

Pin	Function	Pin	Function
1	Reset*	2	Gnd
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Gnd	20	Key
21	NC	22	Gnd
23	IOW*	24	Gnd
25	IOR*	26	Gnd
27	CHRDYB	28	+5V
29	NC	30	Gnd
31	IRQ14	32	NC
33	A1	34	NC
35	A0	36	A2
37	CS0*	38	CS1*
39	NC	40	Gnd
41	+5V	42	+5V
43	Gnd	44	+5V

* = active low

Table A–26 COM5 / COM6 - GPS: J19

Port	Pin	Signal	Port	Pin	Signal
COM6	1	TxD (RTCM SC-104)		6	nc
COM6	2	RxD (RTCM SC-104)	COM5	7	DTR
COM5	3	RxD		8	nc
COM5	4	RTS		9	Gnd
COM5	5	TxD		10	Antenna power *

* The jumper at W24 selects the voltage for a GPS antenna. For a 5V antenna, position the jumper across pins 1-2 (default). For a 12V antenna, position the jumper across pins 3-4.

Table A–27 Keyboard / Mouse: J20

Pin	Function
1	Keyboard data
2	Mouse data
3	Gnd
4	+5V Safe
5	Keyboard clock
6	Mouse clock

Appendix B: Software utilities

≡ Introduction

The PC–680 ROM–DOS and Software Utility Disk comes with the utilities listed below. Some of these utilities are also available on the PC–680 BIOS drive. This appendix describes the utilities and their use.

Support commands and device drivers:

- GETBIOS.EXE
- GETIMG.EXE
- GETIMGH.EXE
- I17HNDLR.EXE
- LCDBIAS.EXE
- LPT1CON.COM
- FXFMT.EXE
- FXDOS.SYS
- PGMBIOS.EXE
- PGMIMG.EXE
- PGMIMGH.EXE
- REMDISK.EXE
- REMQUIT.COM
- REMSERV.EXE
- RESET.COM
- SETSSD.EXE
- TESTOEM.EXE
- TRANSFER.EXE

Note Other utilities are included from ROM–DOS and are not mentioned in this section. Please refer to your ROM–DOS manual.

≡ GETBIOS.EXE

Purpose

This support command stores the BIOS information in a specific file.

Syntax

GETBIOS SSD*x filename*

Parameters

- **SSD***x* specifies the target SSD that stores the BIOS. The variable *x* represents a value of 0, 1, or 1P for SSD0, SSD1, or SSD1P .
- *filename* specifies the output file for saving or programming.

≡ GETIMG.EXE

Purpose 1

This support command captures an image of an SSD and places it into a local file.

Syntax 1

GETIMG SSD*x filename*

Purpose 2

This support command captures an image of an SSD and transfers it to a host PC running **GETIMGH**.

Syntax 2

GETIMG SSD*x* **/COM***x* [**/B***xx*] [**/I***xx*]

Purpose 3

This support command captures an image of an SSD and transfers it to a host PC running GETIMGH. A non–standard serial port I/O address is used and the IRQ value must be specified.

Syntax 3

GETIMG SSD*x* **/U***xxxx* [**/B***xx*] [**/I***xx*]

Parameters

- **SSD***x* specifies the target SSD for file saving or programming. The variable *x* represents a value from 0 to 1.
- *filename* specifies the output file for saving or programming.
- **/COM***x* specifies the PC COM port for serial transfer where *x* represents a value from 1 to 4.
- **/U***xxxx* specifies the UART base address to use for serial transfer. The base address, 100–3FF, is in hexadecimal format.
- **/B***xx* specifies baud rate of transfer where *xx* can be (300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115 (115200)). The default is 38400 when using a **/COM***x* switch.
- **/I***xx* specifies the interrupt to which the UART is connected. The value *x* represents a variable from 3 to 15.

Remarks

GETIMG compatibility:

The following devices share the same image and can be used interchangeably: Atmel's AT29C040 and AT29C040A; SST's 28SF040; 512K EPROM; and 512K SRAM. Use an EPROM to make the drive read–only.

Because the AMD 512K, 1MB, and 2MB have a different structure, they cannot be used in any other type of device. An image from a 512K AMD flash can only be used on other 512K AMD flashes.

≡ GETIMGH.EXE

Purpose 1

This support command transfers an SSD image from a target PC running **GETIMG** and saves the image to a host file.

Syntax 1

GETIMGH *filename* **/COM***x* [**B***xx*] [**/I***xx*]

Purpose 2

This support command transfers an SSD image from a target PC running GETIMG and saves the image to a host file via a serial UART connection. A non–standard serial port address is used and the IRQ value must be specified.

Syntax 2

GETIMGH *filename* /**U***xxx* [/**B***xx*] /**I***xx*

Parameters

- *filename* specifies the output file for saving or programming and it also represents the host filename.
- /**COM***x* specifies the PC COM port for serial transfer. The variable *x* represents a value from 1 to 4.
- /**U***xxx* specifies the UART base address to use for serial transfer. The base address, 100–3FF, is in hexadecimal format.
- /**B***xx* specifies baud rate of transfer where *xx* can be (300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115 (115200)). The default is 38400 when using a /**COM***x* switch. If COM1 is the console, the baud rate defaults to the current console baud rate.
- /**I***xx* specifies the interrupt to which the UART. The variable *x* represents a value from 3 to 15.

See also

GETIMG.EXE for details on image compatibility.

≡ I17HNDLR.EXE

Purpose

This support command allows the system to use the INT 17 functions when the extended BIOS area is disabled (i.e., W2[9–10] is not jumpered) or when it is reprogrammed with another BIOS.

Syntax

I17HNDLR

Remarks

This command is used if the extended BIOS area (D000h–D7FFh) is disabled ("X" jumper is not installed). The I17HNDLR allows the system to use the INT 17 functions.

≡ LCDBIAS.EXE

Purpose

This support command adjusts the LCD bias voltage to obtain the best contrast for the LCD flat panel. The LCD TSR (Terminate and Stay Resident) works in combination with the INT 17 extended BIOS/TSR. Press <CTRL><+> to increase the voltage <CTRL><–> to decrease the voltage. These keystrokes adjust the voltage within the PC–680's pre–defined voltage range (factory default is +22V to +30V). The <–> and <+> are on the 101 "key enhanced" numeric keypad. The <–> and <+> are also on the local keyboard as well as the <CTRL> keystroke.

Syntax

```
LCDBIAS [/D] [/R] [/U]
```

Parameters

- **/D** shows a display of "<" or ">" when the LCDBIAS TSR detects a <CTRL><–> or <CTRL><+>. This display may interfere with graphics based programs.
- **/R** reinstalls the TSR when detection occurs of a previous TSR copy of the LCD bias.
- **/U** uninstalls the TSR. /U only removes the vectors and not the memory usage of the TSR. TSRs must be removed in the order of last installed, first removed.

Example 1

To install the LCDBIAS TSR and its display after the LCD bias voltage has been adjusted, enter the following command:

```
LCDBIAS /D
```

Example 2

To install the LCDBIAS TSR only and *not* a display of its adjusted characters, enter:

```
LCDBIAS
```

Example 3

If possible, to uninstall the LCDBIAS TSR, enter this command:

```
LCDBIAS /U
```

Remarks

If the INT 17 extended BIOS/TSR has not been previously installed, then the LCD TSR will not install.

See also

I17HNDLR.EXE and the *CRTs and flat panels* chapter.

≡ LPT1CON.COM

Purpose

This support command redirects the video to the LPT1 port.

Syntax

```
LPT1CON
```

Remarks

If you have a 2010 interface board and an LCD display connected to the LPT1 port, executing the DISPLAY.EXE and LPT1CON.COM programs allow you to use the display as the system console. You must reset your system to change the video to the original parameters.

≡ FXFMT.EXE

Purpose

This support command formats preformatted or unformatted drives.

Syntax

FXFMT <*drive*> **[/C] [/M] [/V]**

Parameters

- *drive* can be specified as **C:** through **Z:** for preformatted drives. For preformatted or unformatted drives, specify *drive* as **80** through **89**, where 0 through 9 represent the hard drive number.
- **/C** is an optional parameter that specifies no confirmation before formatting.
- **/V** is an optional parameter that specifies a volume label is to be placed on disk.

Example 1

To place a volume label on disk for preformatted drive D:, enter:

```
FXFMT d: /V
```

Example 2

To have PICO FA write an MBR to drive H0, enter:

```
FXFMT 80 /M
```

≡ FXDOS.SYS

Purpose

An alternate way to access the on–board SSD. By using this driver, it is possible to free up the address area at D0000h–D7FFFFh by the "X" jumper.

Syntax

PICOFA.SYS

Remarks

This command will not allow booting from an SSD.

≡ PGMBIOS.EXE

Purpose

This support command programs a new system BIOS into the PC–680.

Syntax

PGMBIOS [*filename* | **SSD***x*] **SSD***y* [**/?**]

Parameters

- *filename* specifies the BIOS .DAT file to program into flash.
- **SSD***x* specifies the source SSD for BIOS. The variable *x* represents a value from 0 to 1.
- **SSD***y* specifies the target SSD for BIOS. The variable *y* represents a value from 0 to 1.
- **/?** requests a help menu.

Example 1

To program the BIOSFILE.BIN files into the SSD1 BIOS area, enter:

```
PGMBIOS BIOSFILE.BIN SSD1
```

Example 2

To program the AT BIOS and extended BIOS from SSD0 to SSD1, enter:

```
PGMBIOS SSD0 SSD1
```

≡ PGMIMG.EXE

Purpose 1

This support command programs a local file image to an SSD.

Syntax 1

PGMIMG SSD*x filename*

Purpose 2

This support command programs a local file image to an SSD and transfers it to a host PC running **PGMIMGH**.

Syntax 2

PGMIMG SSD*x* **/COM***x* [**B***xx*] [**I***xx*]

Purpose 3

This support command programs a local file image to an SSD and transfers it to a host PC running PGMIMGH. A non–standard serial port I/O address is used and the IRQ value must be specified.

Syntax 3

PGMIMG SSD*x* **/U***xxxx* [**B***xx*] **/I***xx*

Parameters

- *filename* specifies the input file programming.
- **SSD***x* specifies the target SSD for image. The variable *x* represents a value from 0 to 1.
- **/COM***x* specifies the PC COM port for serial transfer. The variable *x* represents a value from 1 to 4.
- **/U***xxx* specifies the UART base address to use for serial transfer. The base address, 100–3FF is in hexadecimal format.
- **/B***xx* specifies baud rate of transfer where *xx* can be (300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115 (115200)). The default is 38400 when using a **/COM***x* switch. If COM1 is the console, the baud rate defaults to the current console baud rate.

- **/I***xx* specifies the interrupt to which the UART base address is connected. The variable *x* represents a value from 3 to 15.

≡ PGMIMGH.EXE

Purpose 1

This support command programs an image file from a target PC running PGMIMG.

Syntax 1

PGMIMGH *filename* **/COM***x* [**/B***xx*] [**/I***xx*]

Purpose 2

This support command transfers an SSD image to a target computer via a serial UART connection and programs the image to an SSD. A non–standard serial port address is used and the IRQ must be specified.

Syntax 2

PGMIMGH *filename* **/U***xxx* [**/B***xx*] **/I***xx*

Parameters

- *filename* specifies the input file for programming and it also represents the host filename.
- **/COM***x* specifies the PC COM port for serial transfer. The variable x represents a value from 1 to 4.
- **/U***xxx* specifies the UART base address to use for serial transfer. The base address, 100–3FF is in hexadecimal format.
- **/B***xx* specifies baud rate of transfer where *b* can be (300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115 (115200)). The default is 38400 when using a **/COM***x* switch. If COM1 is the console, the baud rate defaults to the current console baud rate.
- **/I***xx* specifies the interrupt to which the UART base address is connected. The variable x represents a value from 3 to 15.

See also

See PGMIMG.EXE. See also, GETIMG for image compatibility.

≡ REMDISK.EXE

Purpose

This support command allows access to a disk drive on a remote system via a serial cable and standard PC style (8250 UART) serial port.

Syntax

REMDISK [**/U**] [**/?**] [**/B***nnnn*] [**+**] [**/COM***n*]

Parameters

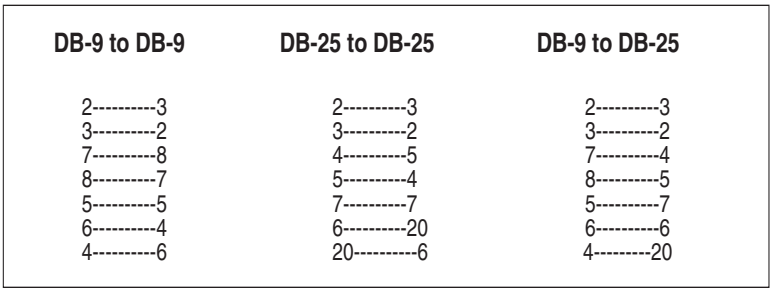
- **/U** tells REMDISK to unload itself from memory, thereby disabling the new drive letter and freeing the memory occupied by REMDISK. The option can only be used when REMDISK is installed from the DOS command line. A Remote Disk installed via CONFIG.SYS cannot be unloaded.
- **/?** displays a short help screen for the REMDISK program. No other arguments are to be included on the command line when the **/?** is used.
- **/B***nnnn* selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115k. The default baud rate is 115k.
- **+** is an optional argument which specifies packet style transmission. This is recommended for any baud rates over 19200. The default for this option is to include the **+** for packet transmission.
- **COM***n* is an optional argument which selects the communication port. Available ports are 1 and 2. COM1 is the default port.

Note To use the Remote Disk, both the REMDISK and the REMSERV programs must be running on their respective systems. Both programs must use the same baud rate and packet or non–packet style transmission. It does not matter which program is installed first.

Remarks

In a Remote Disk setup, one system, the one that will share its drives, is termed the Server. The other system, the one that will access and use the remote drives, is called the Client. The serial ports on both systems must be connected via a null modem cable. A cabling diagram for a standard cable is shown below.

Figure B–1 Cabling diagram for a standard cable



Run REMDISK.EXE on the Client system. This program creates a new drive letter for the Client. REMDISK will use the next available system drive letter. For example, if the last assigned drive was D:, REMDISK will create a drive E:. This drive acts in all ways just like any other drive, except for the fact that it requires the serial port to do its job.

REMDISK.EXE can be installed using a **DEVICE=** command in CONFIG.SYS or from the DOS prompt.

Example 1

To install the REMDISK program from CONFIG.SYS at 19200, on COM1, using packet style transmission, enter the following in CONFIG.SYS and then reboot the system (remember to include the full path to find REMDISK.EXE if not located in the root directory):

```
DEVICE=REMDISK.EXE /B19200 +
```

Example 2

To display a help screen for REMDISK, enter the following at the DOS prompt:

```
REMDISK /?
```

Example 3

To install REMDISK from the DOS prompt or from a batch file (like AUTOEXEC.BAT) at 9600 baud, without packet style transmission,

on COM2, enter the following;

```
REMDISK /B9600 /COM2
```

Example 4

To unload the REMDISK installed from the batch file or the DOS prompt, type:

```
REMDISK /U
```

See also

REMSERV.EXE

≡ REMQUIT.COM

Purpose

This support command cancels a REMSERV session on a remote system.

Syntax

```
REMQUIT
```

Remarks

Once a REMDISK/REMSERV connection is no longer needed, the REMQUIT command is used (on the same CPU running REMDISK) to cancel the REMSERV command. You may also press the ESC key if you have access to a local keyboard to the CPU running REMSERV.

See also

REMSERV.EXE, REMDISK.EXE

≡ REMSERV.EXE

Purpose

This support command makes a single drive at a time on the server system available to the Client. The available drive can be changed at any time by quitting the REMSERV program and then running the program again with a new drive letter.

Syntax

REMSERV.EXE *d:* [**/B***nnnn*] [**+**] [**/COM***n*] [**/S**]

Parameters

- *d:* represents the letter of the drive that the Server will make available to the Client.
- **/B***nnnn* selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115k. The default baud rate is 115k.
- **+** is an optional argument which specifies packet style transmission. This is recommended for any baud rates over 19200. The default for this option is to include the **+** for packet transmission.
- **COM***n* is an optional argument which selects the communication port. Available ports are 1 and 2. COM1 is the default port.
- **/S** instructs REMSERV to run silently, that is without any screen output.
- **/?** is an unlisted option which is used to print a short help screen for the REMSERV program. If the **/?** is used, the drive letter argument is omitted, for example:

  REMSERV /?

Example 1

To select drive B: as the available Server drive at 115K baud, packet style transmission, using COM1, you would enter the following:

REMSERV B:

Example 2

To set drive C: as the Server disk at 9600 baud, without packet style transmission, on COM2, you would enter the following:

REMSERV C: /B9600 /COM2

Note The Server program can be terminated at any time by pressing the <ESC> key. The Client can then no longer access the Server's drive until the REMSERV program is run again.

See also

REMDISK.EXE

≡ RESET.COM

Purpose

This support command enables the watchdog timer and allows time–out to expire, thus restarting the system.

Syntax

RESET

Remarks

The RESET command also restarts all the expansion I/O cards on the bus. This differs from a <CTRL><ALT><DEL> reboot of the system which only restarts the system but not the expansion cards. The RESET button on the PC–680 also accomplishes the same thing as the RESET command.

≡ SETSSD.EXE

Purpose

This support command configures PICO FA device order.

Syntax

SETSSD [SSD*n*] [SSD*m*] [/before | /after] [/NoSSD] [/?] [/D] [/SSDnBIOS+ | /SSDnBIOS–] [SSDn BIOS] [/WPn+ | /WPn-]

Parameters

- **SSD***n* specifies one SSD.
- **SSD***m* specifies two SSDs.
- **/before** is an optional parameter that indicates the SSDs are to be allocated before any hard drives. The first SSD specified will be the boot device.
- **/after** is an optional parameter that indicates the SSDs are to be allocated after any hard drives. The hard drive will be the boot device. This is the default.
- **/NoSSD** is an optional parameter that specifies that no SSDs are to be allocated.
- **/?** displays a short help screen for the SETSSD program. No other arguments are to be included on the command line when the **/?** is used.
- **/D** is an optional parameter that specifies SETSSD to use its defaults.
- **/SSD0BIOS+** reserves all the BIOS area of SSD0 (default).
- **/SSD0BIOS**– does not reserve the BIOS area of SSD0.
- **/SSDn BIOS** reserves only SSD1P BIOS area on SSD1.
- **/WPn+** enables write protection on drive n.
- **/WPn**– disables write protection on drive n.

Remarks

If the boot order in SETUP is set to "A: THEN C:," the system tries to boot from a floppy (if one exists) and then it tries to boot from the C: drive. The C: drive can be either an SSD or an HDD depending upon which switch, **/before** or **/after**, was selected. If the boot order is set to "C: ONLY," the floppy check is not performed. You may override

the order of the SSD by removing the USESETUP jumper.

See also

See the *SETSSD* section in the *SETUP programs* chapter.

≡ TESTOEM.EXE

Purpose

This support command tests PICO FA drives.

Syntax

TESTOEM [**/S***n*] [**/A**] [**/E**] [**/F**]

Parameters

- **/S***n* is an optional parameter that specifies the socket to be tested. The variable *n* represents a value from 0 to 1, where 0 represents the first* PICO FA drive and 1 represents the second* PICO FA drive.

  * = As apparently set by the SETSSD command.

- **/A** is an optional parameter that specifies all sockets are to be tested.
- **/E** is an optional parameter that specifies test writing to every byte.
- **/F** is an optional parameter that specifies a "full" test. This option is equivalent to **/A** and **/E** combined.
- No parameters on the command line will display a help message.

> **WARNING!**
>
> After this program is executed, the drive tested will require reformatting using the FXFMT program.

See also

SETSSD.EXE, FXFMT.EXE

≡ TRANSFER.EXE

Purpose

This support command transfers files to or from the PC–680 over a serial port.

Syntax

TRANSFER *filepath* [**/S** | **/R**] [**/B***xxxx*] [**/V**] [**/COM***x*]

Parameters

- *filepath* specifies the file pathname to send or receive.
- **/S** specifies to send the file.
- **/R** specifies to receive the file. This is the default.
- **/B***xxxx* specifies baud rate of transfer where *xxxx* can be (300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115 (115200)). The default is 9600 when using a **/COM***x* switch. If COM1 is the console, the baud rate defaults to the current console baud rate.
- **/V** enables the display of "R" when a block (128 bytes) is received, or "T" when a block is transmitted.

Note Do not use **/V** when COM1 is the console device.

- **/COM***x* specifies the serial port to use where *x* represents a value from 1–4. The default is 1.

Example 1

To send a file named C:\MPC\DEMO\DEMO.EXE on the PC–680 when using COM1 as the console, enter the following command:

TRANSFER D:DEMO.EXE

On the remote PC executing SmartLINK, press <ALT> <D>, type C:\MPC\DEMO\DEMO.EXE, and then press ENTER.

Example 2

To send a file named D:DEMO.BAS to the file C:\TEST.BAS on the remote PC when using COM1 as the console, enter the following on the PC–680:

TRANSFER /S D:DEMO.BAS

On the remote PC executing SmartLINK, press <ALT> <U>, type C:\TEST.BAS, and then press <ENTER>.

Example 3

To send a file named C:\DEMO\DEMO.EXE from a remote PC to the file named D:\DEMO.EXE on the PC–680 at 57600 baud with a serial cable from COM2 on the remote PC and COM1 on the PC–680, enter the following command on the PC–680:

TRANSFER D:\DEMO.EXE /R /V /B57600

Then enter the following command on the remote PC:

TRANSFER C:\DEMO\DEMO.EXE /S /V /COM2 /B57600

To receive a file named D:\MYAPP.EXE from the PC–680 and name it C:\APPS\MYAPP2.EXE on the remote PC over a serial cable connected to COM1 on both systems at 9600 baud, enter the following command on the PC–680:

TRANSFER D:\MYAPP.EXE /S

Then enter the following command on the remote PC:

TRANSFER C:\APPS\MYAPP2.EXE

Remarks

The TRANSFER command communicates with other XMODEM compatible file transfer programs.

The serial port on the PC–680 requires a null modem adapter when connected to a serial port on the remote PC. See the *Serial ports* chapter more information.

The maximum baud rate is dependent on the processor speeds of the remote PC and the PC–680.

The received file size is rounded up to the nearest 128 byte boundary.

See also

REMDISK.EXE, REMSERV.EXE

Appendix C: Third party support

≡ Using M–Systems DiskOnChip (DOC)

To use the M–Systems DiskOnChip (DOC) module with your PC-680 CPU, follow these steps:

1. Run BIOS Setup. In the Main Screen, enable the "Enable SSD0 Scan" option.
2. Power off the PC-680 CPU.
3. Make sure SSD0 is jumpered for flash by configuring W20[2–4], and W21[1-2][5-7][9-10].
4. Install the DOC module into SSD0. Make sure to orient pin 1 on the DOC module with pin 1 on SSD0.

WARNING!

Incorrectly installing the DOC module into SSD0 will permanently damage the DOC module.

Appendix D: Accessories

Table D–1 Cables and terminal board

Product	Description	Octagon part number
VTC-20F	Dual serial cable	4866
Null modem adapter	9-pin to 9-pin	2470
VGA-12	VGA monitor cable	4865
CMA-26-12	12" cable for EZ I/O port	2776
CMA-26-24	24" cable for EZ I/O port	1257
3.5" hard drive adapter	2mm connector to 2.5", 3.5" hard drive	4080
STB-26	Terminal board, 26-position	2905

Table D–2 LCD displays and keypads

Product	Description	Octagon part number
LCD–4 x 20	LCD display w/cable, 40 character	2783
LCD–4 x 40	LCD display w/cable, 80 character	2784
2010	LCD display/keypad interface	3909
KP-1	Keypad w/cable, 16-key, low cost	1218
KP-2-16	Keypad w/cable, 16-key, relegendable	1736

Table D–3 Miscellaneous part numbers

Product	Description	Octagon part number
AT battery	Calendar/clock battery backup	3186
CAMBASIC	Multitasking, industrial control programming language	4059

Appendix E: Operation in severe environments

Operation under high / continuous vibration

All card level products are required to pass the vibration specification below:

1) A sine sweep from 10 Hz to 500 Hz was made with a sweep frequency of 2 octaves per minute as per MIL STD202, method 204, condition A. From 10 Hz to 14 Hz, the amplitude was set to 0.5 inches. From 14 Hz to 500 Hz the apparatus was set for a 5g vibration.

2) The second test was a random vibration profile as per MIL STD 202, method 214, condition II F to 500 Hz. This test was continued for 10 minutes.

Subsequent to these tests the force levels were increased for purposes of testing the amount of margin in the design. Force levels were then lowered to the 5g level and the tests were repeated as above on all three axes with the sweep frequency decreased to 1 octave per minute.

The results of these tests cannot be used to predict the reliability of the system components to withstand continuous, long term vibration. The major long-term effects are fatigue of component leads and solder joints. System designers should use prudent methods of securing the cards using all available mounting points and isolating them from sources of vibration. Further, they should measure the G forces at various places on the card to insure that the specifications are no exceeded. In more severe environments, techniques like placing epoxy at the corners of large ICs and conformal coating maybe be minimum requirements. Please contact the Octagon Applications Department if you have any questions.

Operation at high temperatures

Continuous operation at high temperatures will have a significant impact on the MTBF for a CPU card. As can be seen from the MIL 217F, MTBF calculations, the mean time between failure at 80ºC will be a fraction of that at 35º C. The CPU cards are rated for case temperature rather than ambient in the same manner as the processor manufacturers.

Provide adequate cooling to the CPU either through heat sinking, a fan or both. Another way to significantly reduce processor junction temperature is to turn the processor at a fraction of the full CPU speed, except when needed. This can be accomplished through the BIOS setup screen. It is always important in high reliability applications to place a thermocouple on the CPU case during the development stage to track the actual temperature.

Warranty

Octagon Systems Corporation (Octagon), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the current established warranty period. Octagon's obligation under this warranty shall not arise until Buyer returns the defective product, freight prepaid to Octagon's facility or another specified location. Octagon's only responsibility under this warranty is, at its option, to replace or repair, free of charge, any defective component part of such products.

Limitations on warranty

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Octagon personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Octagon.
2. Products which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.
3. The design, capability, capacity, or suitability for use of the Software. Software is licensed on an "AS IS" basis without warranty.

The warranty and remedies set forth above are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which Octagon specifically disclaims. Octagon neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Octagon shall have no liability for incidental or consequential damages of any kind arising out of the sale, delay in delivery, installation, or use of its products.

Service policy

1. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.
2. Customers that return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

Returning a product for repair

Upon determining that repair services are required, the customer must:

1. Obtain an RMA (Return Material Authorization) number from the Customer Service Department, 303-430–1500.
2. If the request is for an out of warranty repair, a purchase order number or other acceptable information must be supplied by the customer.
3. Include a list of problems encountered along with your name, address, telephone, and RMA number.
4. Carefully package the product in an antistatic bag. (Failure to package in antistatic material will VOID all warranties.) Then package in a safe container for shipping.
5. Write RMA number on the outside of the box.
6. For products under warranty, the customer pays for shipping to Octagon. Octagon pays for shipping back to customer.
7. Other conditions and limitations may apply to international shipments.

Note PRODUCTS RETURNED TO OCTAGON FREIGHT COLLECT OR WITHOUT AN RMA NUMBER CANNOT BE ACCEPTED AND WILL BE RETURNED FREIGHT COLLECT.

Returns

There will be a 15% restocking charge on returned product that is unopened and unused, if Octagon accepts such a return. Returns will not be accepted 30 days after purchase. Opened and/or used products, non-standard products, software and printed materials are not returnable without prior written agreement.

Governing law

This agreement is made in, governed by and shall be construed in accordance with the laws of the State of Colorado.

The information in this manual is provided for reference only. Octagon does not assume any liability arising out of the application or use of the information or products described in this manual. This manual may contain or reference information and products protected by copyrights or patents. No license is conveyed under the rights of Octagon or others.